Title of Proposal - Talison Lithium Australia: Greenbushes Mine Expansion

Section 1 - Summary of your proposed action

Provide a summary of your proposed action, including any consultations undertaken.

1.1 Project Industry Type

Mining

1.2 Provide a detailed description of the proposed action, including all proposed activities.

The Greenbushes Lithium Mine is an existing mining operation owned and operated by Talison Lithium Australia Pty Ltd (Talison, or the Proponent). The mine is located within the Shire of Bridgetown – Greenbushes immediately south of the Greenbushes townsite, approximately 250 km south of Perth and 80 km south east of Bunbury (Attachment 1 – Figure 1). The Greenbushes area has been subject to mining activity since the discovery of tin in the 1880's. The current Greenbushes Lithium Mine has been operated as a modern open cut, hard rock operation on a continuous basis since 1983, with both tantalum and spodumene (lithium) ores being extracted and processed. Talison currently undertakes mining and processing of spodumene ore at the Greenbushes Lithium Mine to produce a lithium mineral concentrate of approximately 6% Lithium Oxide (Li2O). The mine is currently authorised to treat up to 4.7 million tonnes per annum (Mtpa) of spodumene ore.
Talison proposes to undertake an expansion of the existing Greenbushes Lithium Mine to increase the production of lithium mineral concentrate from the Greenbushes deposit (the proposed action, the Project). The expansion will increase throughput at the Greenbushes operation from the current 4.7 Mtpa to 9.5 Mtpa of spodumene ore to produce up to 2.3 Mtpa of lithium mineral concentrate.
The increase is planned to meet the increasing global demand for lithium products. The mine is globally recognised as a high grade deposit, and is the world's largest hard rock lithium reserve. There is currently a global surge in the demand for lithium products and it is expected that annual demand for lithium will continue to rise significantly as a result of the increased usage of lithium for battery applications. Primary drivers of lithium demand are expected to come from hybrid and electric cars, electrical grid storage, power tools, mobile phones and computers. The two owners of the Greenbushes mine, Tianqi Lithium and Albemarle Corporation, are developing or proposing to develop downstream processing operations, at Kwinana and Kemerton (WA). The two operations, once operational, will receive the increased lithium mineral concentrate production output from the mine.
The expansion will increase the Mine Development Envelope (MDE) by 328 ha from the current 1,591 ha area to 1,919 ha (20.6% increase). The expansion will require up to 385 ha of clearing within the Mine Development Envelope to establish infrastructure and expand or develop new landforms. The expanded Mine Development Envelope is illustrated in Attachment 1 - Figure 2 and proposed expansion clearing areas are illustrated in Attachment 1 - Figure 3. The expansion will comprise the following elements:

Mining
The ore body will continue to be mined via conventional hard rock open cut methods of drill, and

blast, load and haul (via truck and excavator). The existing lithium pits C1-C3 will be combined into a single expanded open pit. The final pit is anticipated to be up to 2.6 km long by 1 km wide and will extend to up to 450 m in depth. The mining rate will be progressively increased in line with increasing processing capacity to 9.5 Mtpa of spodumene ore. Waste rock mining will correspondingly increase. Waste rock will be hauled to the existing Floyds Waste Rock Landform (WRL,) which will be expanded to accommodate the additional waste rock produced from the mining operation. The maximum height of the Floyds WRL is expected to align with the current approved design height of mine RL 1330 m.
Additional water capture dams are also proposed to be established at the foot of Floyds WRL to capture surface water for supply to the mining operation.

Processing
Two new chemical grade processing plants CGP3 and CGP4 will be established to the west of Maranup Ford Road. A two stage crushing circuit, Talison Crusher 3, will also be established to the east of the road (adjacent to the existing CGP2 ROM) to supply the plants. Each plant will have a design capacity of up to 2.4 Mtpa and will produce a combined total of up to 1.05 Mtpa of lithium mineral concentrate at approximately 6% Li2O. The plants will be a near identical replication of CGP2 which is currently under construction.

Tailings Storage
The volume of tailings produced from the processing of spodumene ore will increase from the current rate of 3.1 Mtpa to approximately 8 Mtpa. An additional TSF is required to accommodate the predicted 107 million tonne of tailings which will be produced over the life of the Project. TSF4 will be constructed to the south of the existing tailings storages (TSF 1-3) to accommodate the additional tailings.

Supporting Infrastructure – Mine Services Area
The existing Mine Services Area (MSA) is not sufficiently sized for the increased mining fleet and is located within the open pit expansion footprint. A new MSA is therefore required for the expanded operation. Talison proposes to construct the new facility to the south of the expanded Floyd’s WRL.
Supporting Infrastructure – Explosive Batching Facility and Magazine
The existing explosive magazine and batching facility is within the footprint of the proposed pit expansion. New facilities therefore need to be established prior to the existing facilities being mined out. A new explosive magazine will be established approximately 500 m west of CGP3/4 and an explosives batching facility established approximately 1 km west of CGP3/4. Access roads will be established to each facility from the CGP3/4.

Supporting Infrastructure – Linear Infrastructure Corridors
The mine expansion will require some additional linear infrastructure including roads, power supply and pipelines. Corridors will be developed for the establishment of the required linear infrastructure.

1.3 What is the extent and location of your proposed action? Use the polygon tool on the map below to mark the location of your proposed action.

Area	Point	Latitude	Longitude
Talison MDE	1	-33.853803690055	116.03919188873
Talison MDE	2	-33.846390341922	116.07498328583
Talison MDE	3	-33.850881196937	116.08202140228
Talison MDE	4	-33.856440976059	116.08657042877
Talison MDE	5	-33.859434553376	116.08777205841
Talison MDE	6	-33.875398526682	116.08802955048
Talison MDE	7	-33.875256004415	116.08124892609
Talison MDE	8	-33.891617491501	116.0811630954
Talison MDE	9	-33.891118757341	116.04322593109
Talison MDE	10	-33.876084116106	116.04236762421
Talison MDE	11	-33.869955492917	116.03232543365
Talison MDE	12	-33.867318624296	116.02914969818
Talison MDE	13	-33.853847943745	116.03910605804
Talison MDE	14	-33.853803690055	116.03919188873

1.5 Provide a brief physical description of the property on which the proposed action will take place and the location of the proposed action (e.g. proximity to major towns, or for off-shore actions, shortest distance to mainland).

The Project is located within the Shire of Bridgetown – Greenbushes in the South West of Western Australia. The existing mine, which will be expanded as a result of this Project, is located immediately south of the Greenbushes townsite, approximately 250 km south of Perth and 80 km south east of Bunbury (Attachment 1 – Figure 1).

The Mine Development Envelope is already largely disturbed as a result of current and historic mining operations. Of the 1,919 ha Mine Development Envelope, approximately 54.8% of the Mine Development Envelope is existing mining related disturbance, 6.6% is rehabilitated mining disturbance, 3.9% is water bodies (dams), 2.7% is a cleared farmland area and 0.5% is a plantation area. The remaining 31.5% comprises native vegetation.

1.6 What is the size of the proposed action area development footprint (or work area) including disturbance footprint and avoidance footprint (if relevant)?

Clearing up to 385 ha of native vegetation within MDE (1,919.07ha). Over 220 ha of Native Vegetation with MDE will be avoided.

1.7 Is the proposed action a street address or lot?

Lot

1.7.2 Describe the lot number and title. Mining Leases: M01/3 M01/6 M01/7 M01/16 General

Purpose Leases G01/1 G01/2

1.8 Primary Jurisdiction.

Western Australia

1.9 Has the person proposing to take the action received any Australian Government grant funding to undertake this project?

No

1.10 Is the proposed action subject to local government planning approval?

No

1.11 Provide an estimated start and estimated end date for the proposed action.

Start date 08/2018

End date 12/2036

1.12 Provide details of the context, planning framework and State and/or Local government requirements.

Open cut mining of the Greenbushes Lithium Deposit commenced in 1983. The mining operation has been subject to various regulatory requirements since this time. The potential environmental impacts of the existing Greenbushes mining operation are primarily regulated through authorisations under the Mining Act 1978 (Mining Act) and Environmental Protection Act 1986 (EP Act).

Hard rock mining, and a 15 year mine operations plan, was initially approved through the Mining Act, on 23 August 1991 following submission and assessment of the Greenbushes Upgrade of Hard Rock Mining Notice of Intent 747 (ID 14168). Extension of the mine life to 2013 and increased mining and processing rates were approved on 8 October 1999 via the Greenbushes Continuation of Hard Rock Mining Notice of Intent (ID 16518). A subsequent Continuation of Hard Rock Mining (III) Mining Proposal was approved on 23 April 2014 by the (now) WA Department of Mines, Industry Regulation and Safety (DMIRS) which approved further continuation of both lithium and tantalum, mining and processing, from 2014 to 2023 (ID 45382). Recent approvals have been sought through the Mining Act for changes at the operation including to increase the height of the tailings storage facility, TSF2 (ID 56542), to construct an additional chemical grade plant (CGP2) (ID 63657) and to construct a new water treatment plant, associated water storage dam (CWD2) and crusher (ID 70390). Construction of CGP2, crusher and the new water treatment plant and CWD2 are currently underway.

In addition to the above, Talison operates under L4247/1991/13 issued under Part V of the EP Act for the processing or beneficiation of metallic or non-metallic ore (Category 5). Three amendment notices have also been issued relating to various proposed changes at the operation including the most recent issued to authorise the construction of the new CGP2 and crusher, water treatment plant and CWD2, and increase the authorised processing throughput

to 4.7 Mtpa.

Clearing for approved mining activities is undertaken under Permit to Clear Native Vegetation CPS 5056/2 (purpose permit) issued under section 51M of the EP Act. The permit authorises clearing of no more than 120 ha within a defined area covering parts of M01/3, M01/6, M01/7, M01/16, G01/1 and G01/2 (Attachment 1 – Figure 4).

Expansion of the Greenbushes Lithium Mine will require the following further approvals or changes to existing approvals.

A new Mining Proposal (in accordance with the 2016 guidelines) is required to be submitted to (and approved by) the DMIRS under the Mining Act. The Mining Proposal will cover the expanded scope of the mining operation as a whole and will include an environmental risk assessment.

A Works Approval (for construction) and Licence amendment (to operate) is required to be submitted to (and approved by) the Department of Water and Environmental Regulation (DWER) under Part V of the EP Act. Applications are required for the new process plants and crusher, TSF and Mine Services Area.

Due to the potential impact of the Project on conservation significant fauna habitat, a referral of the Project under Part IV of the EP Act will be submitted to the Environmental Protection Authority (EPA) to determine whether approval by the State (WA) Minister for Environment will be required.

If the EPA’s decision is that the environmental impacts of the Project can be adequately managed under the existing regulatory framework, and therefore does not require State (WA) Minister for Environment approval under Part IV of the EP Act, a new Clearing Permit, under section 51 of the EP Act, will be sought for the additional 385 ha of clearing required for the expansion.

1.13 Describe any public consultation that has been, is being or will be undertaken, including with Indigenous stakeholders.

The Greenbushes mine is an existing project and therefore has an established stakeholder engagement program. Relevant stakeholders are consulted in relation to plans and changes at the operation as required. The surrounding communities are kept informed of activities at the operation through regular presentations at Grow Greenbushes meetings (formerly known as the Greenbushes Rate Payers and Residents Association) and contributions to local publications including the Warren Blackwood Times, Donnybrook-Balingup Post and the Greenbushes-Balingup Newsletter. Talison present an update to Grow Greenbushes at monthly meetings. This forum is also used to advise the community of the proposed changes at the mine and obtain feedback on any issues or concerns that the community may have.

Talison also maintains an open communication channel with key government stakeholders. Annual reports inform and update agencies on activities and compliance at the operation. Talison also organise a joint regulatory agency site visit with representatives from the DWER, DMIRS and Department of Biodiversity, Conservation and Attractions (DBCA) invited to attend.

Talison presents the company's environmental performance and plans for the coming year at this event. Typically this event is organised annually although may be held less frequently if Talison has been in regular contact with the involved government Departments over the preceding year.

The key stakeholders for the Project are considered to include the following:

- Bridgetown-Greenbushes Shire

- Greenbushes and North Greenbushes Communities (Grow Greenbushes, residents and ratepayers association)

- Neighbouring rural landholders

- Bridgetown Community

- Balingup Community

- South West towns along the key transport route

- South West Boojarah and Wagyl Kaip Native Title Groups via the South West Aboriginal Land and Sea Council

- Department of Biodiversity Conservation and Attractions (DBCA)

- Department of Mines, Industry Regulation and Safety (DMIRS)

- Department of Water and Environmental Regulation (EPA Services, Regulatory Services, Water Services Units) (DWER)

- Department of Environment and Energy (Federal) (DoEE)

- Blackwood Basin Group (local landcare group)

Consultation with the key stakeholders identified will be undertaken throughout the development of the expansion. Talison has commenced consultation with regulatory stakeholders primarily in relation to the approvals required for the Project.

1.14 Describe any environmental impact assessments that have been or will be carried out under Commonwealth, State or Territory legislation including relevant impacts of the project.

A referral under Section 38, Part IV of the EP Act is under preparation and will be submitted to the EPA shortly following this EPBC Act referral. The referral includes an environmental impact assessment for the expansion against the EPA's Environmental Factors. The environmental impact assessment identifies potential impacts to:

flora, vegetation and terrestrial fauna associated with land clearing;terrestrial environmental

quality associated with land clearing, storage of environmentally hazardous substances (chemicals and hydrocarbons), and storage of waste rock and tailings within constructed landforms;hydrological processes associated with alteration of the topography and land clearinginland waters environmental quality associated with land clearing, production and storage of tailings, production and storage of contaminated process water and processing activities; andair quality associated with dust emissions from the mining operation.

The environmental impact assessment for the Project indicates that the impacts associated with the mine expansion can be managed under the existing regulatory regime. The existing regime, as described in section 1.12, comprises a clearing permit issued under section 51M of the EP Act, works approvals and licence amendments for construction and operation issued under Part V of the EP Act, Mining Proposal and Closure Plan approval under the Mining Act, and approval of a controlled action under the Federal EPBC Act.

Impact assessment is also a component of the following approval applications which will be submitted for the expansion.

Native Vegetation Clearing Permit (if required)Works Approval Application and LicenceMining Proposal and Mine Closure Plan

Talison has completed an updated assessment of flora and vegetation (Onshore Environmental 2018) and terrestrial fauna (Biologic 2018a and 2018b) and are undertaking a number of additional studies to support and inform the impact assessment which will be undertaken for each of the approvals required for the Project.

1.15 Is this action part of a staged development (or a component of a larger project)?

No

1.16 Is the proposed action related to other actions or proposals in the region?

Yes

1.16.1 Identify the nature/scope and location of the related action (Including under the relevant legislation).

Clearing for expansion of the Floyd’s WRL was referred to the Department of Environment and Energy (DoEE) (EPBC 2013/6904) in 2013 due to potential impact of the clearing on Matters of National Environmental Significance (MNES) (Black Cockatoo Habitat). This proposed clearing was deemed a controlled action and in 2016 approval was granted to clear up to 75.7 ha of black cockatoo habitat for the waste dump expansion subject to conditions and offsets. Clearing for the expansion of the waste dump is predominantly complete.

An offset area of 121.7 ha of remnant patches of Marri/Jarrah woodland within farmland in the Shire of Boyup Brook has been established as conservation estate as an outcome to the action described.

Section 2 - Matters of National Environmental Significance

Describe the affected area and the likely impacts of the proposal, emphasising the relevant matters protected by the EPBC Act. Refer to relevant maps as appropriate. The interactive map tool can help determine whether matters of national environmental significance or other matters protected by the EPBC Act are likely to occur in your area of interest. Consideration of likely impacts should include both direct and indirect impacts.

Your assessment of likely impacts should consider whether a bioregional plan is relevant to your proposal. The following resources can assist you in your assessment of likely impacts:

• Profiles of relevant species/communities (where available), that will assist in the identification of whether there is likely to be a significant impact on them if the proposal proceeds;

• Significant Impact Guidelines 1.1 – Matters of National Environmental Significance;

• Significant Impact Guideline 1.2 – Actions on, or impacting upon, Commonwealth land and Actions by Commonwealth Agencies.

2.1 Is the proposed action likely to have ANY direct or indirect impact on the values of any World Heritage properties?

No

2.2 Is the proposed action likely to have ANY direct or indirect impact on the values of any National Heritage places?

No

2.3 Is the proposed action likely to have ANY direct or indirect impact on the ecological character of a Ramsar wetland?

No

2.4 Is the proposed action likely to have ANY direct or indirect impact on the members of any listed species or any threatened ecological community, or their habitat?

Yes

2.4.1 Impact table

Species	Impact
Carnaby's Cockatoo (Calyptorhynchus latirostris) - Endangered Baudin's Cockatoo (Calyptorhynchus baudinii) - Endangered	The Mine Development Envelope is located within the modelled distribution for all three species of black cockatoo (DSEWPaC, 2012). It

Species	Impact
Forest Red-tailed Black Cockatoo (FRTBC) (Calyptorhynchus banksii naso) - Vulnerable	is located within the feeding and predicted breeding range of Baudin's Cockatoo and Forest Red-tailed Black Cockatoo (FRTBC), and the feeding and known breeding range of Carnaby's Cockatoo. Breeding and foraging habitat within the wider Greenbushes area for all three species of black cockatoo is generally abundant, with significant areas of native jarrah/marri forest in the region (Ennovate, 2018). A number of targeted black cockatoo habitat surveys have been undertaken within the Mine Development Envelope and surrounding area, notably Biologic (2011) and Kirkby (2011 and 2018). A fauna survey undertaken by Biologic (2018b) did not specifically include a survey for black cockatoos or their habitat but reported on opportunistic records during their survey of the FRTBC within the Mine Development Envelope. All three species of Black Cockatoo have been recorded within the Mine Development Envelope and surrounds (Kirkby, 2011, 2018; Biologic, 2011, 2018b). Carnaby's Cockatoo and FRTBCs were heard calling during the 2018 field survey and feeding residues from all three species were observed within the Mine Development Envelope (374 from FRTBCs, 61 from Baudin's Cockatoo and 5 from Carnaby's Cockatoo) (Kirkby, 2018). Feeding residues from FRTBC ranged from fresh through to old and grey indicating the site is used throughout the year by this species. Feeding residues from Baudin's Cockatoo were older and indicate that they may only be present in the non-breeding season. Very few residues from the Carnaby's Cockatoo were located. Most feeding residues were from the seeds of Marri. The survey area also has other small patches of foraging suitable for Baudin's and Carnaby's Cockatoos such as Banksia grandis and Hakea prostrata but none seem to have been utilised. Apart from a small amount of feeding by Carnaby's Cockatoos on pine seeds no other species were noted to have been taken. Fifty potential breeding trees with hollows were identified within remaining vegetation in the Mine Development Envelope (Kirkby 2018). Of these, 30 had chew marks indicating use by black cockatoos, although

Species	Impact
	none were active at the time of the survey (February). Only one had signs of recent chewing (Kirkby 2018). Two roost sites were observed within the Mine Development Envelope during the field survey (Biologic, 2018b). All of the up to 385 ha of vegetation required to be cleared as part of the expansion comprises black cockatoo feeding or foraging habitat. It is comprised of both the Jarrah/Marri Forest and Jarrah/Marri Forest over Banksia broad fauna habitats described by Biologic (2018b). Although the quality of the habitat varies in regards to its value for black cockatoos, the majority is considered to be moderate quality (Ennovate, 2018). The cockatoo habitat within the Mine Development Envelope and surrounding Talison mining tenure is illustrated in Attachment 1 - Figure 5 and Figure 6. Significant Impact Guidelines An assessment of impacts on Black Cockatoos was undertaken against the Significant Impact Guidelines 1.1 (DotE 2013) as presented below. The assessment includes criteria for Endangered species. Criteria: Lead to a long-term decrease in the size of an important population of a species. Response: Unlikely Reasoning: The mine expansion will result in the removal of up to 385 ha of suitable foraging and potential breeding habitat inclusive of up to 50 potential breeding trees with hollows. Black cockatoo habitat is well represented within the locality. The estimated area of suitable foraging habitat available within the Shire of Bridgetown-Greenbushes (based on current extent of Beard Vegetation Association 3 - Medium Forest; Jarrah-Marri, which the entire Mine Development Envelope is mapped as) is 68,440 ha (GoWA 2018a). Therefore the Project may reduce the overall area of habitat by an estimated 0.64% within the Shire of Bridgetown-Greenbushes as a result of direct loss of habitat from clearing. There are large blocks of suitable foraging habitat surrounding the Mine Development Envelope as it is located within the Greenbushes State Forest. The proposed action, without the implementation of species specific mitigation measures, is unlikely to result in a long-term decrease in the size of a

Species	Impact
	population of this species as it is unlikely to substantially: -reduce the overall area of available habitat to the population -reduce the overall area of occupancy of the population -exacerbate existing barrier effects or create new barrier effects -disrupt the breeding cycle of part of the population. Therefore, it is considered that the clearing associated with the mine expansion is unlikely to lead to a long-term decrease in the size of the local population of the Carnaby's Black Cockatoo, Baudin's Black Cockatoo or Forest Red-tailed Black Cockatoo. Criteria: Reduce the area of occupancy of an important population Response: Unlikely Reasoning: The Project is unlikely to substantially reduce the area of occupancy of the population of Carnaby's Black Cockatoo, Baudin's Cockatoo or Forest Red-tailed Black Cockatoo within the local area or region. The species are known to occur throughout the greater South-West region and Southern Jarrah Forest bioregion. Black cockatoo habitat is well represented within the locality. The estimated area of suitable foraging habitat available within the Shire of Bridgetown-Greenbushes (based on current extent of Beard Vegetation Association 3 - Medium Forest; Jarrah-Marri) is 68,440 ha (GoWA 2018a). Of this, 87% is in DBCA-managed land. The Project may reduce the overall area of habitat by a maximum of 0.64% within the Shire of Bridgetown-Greenbushes as a result of direct loss of habitat from clearing. There are large blocks of suitable foraging habitat surrounding the Mine Development Envelope as it is located within the Greenbushes State Forest. There are also 20,950 ha of government-owned Black Cockatoo habitat within 10 km and over 50,000 ha within 15 km (Ennovate, 2018). Considering that flocks are known to travel up to 13 km a day, the proposed clearing of up to 385 ha of habitat within the Mine Development Envelope is not considered to be substantial for the species in a local or regional context and is unlikely to reduce their area of occupancy. Criteria: Fragment an existing important population into two or more populations Response: Unlikely Reasoning: The Project is

Species	Impact
	unlikely to fragment the population into two or more populations. Much of the Mine Development Envelopment (1,919 ha) is already cleared for the existing mining operation and has been this way for the majority of the 30 plus years of open cut mining activity at Greenbushes. The Project is an expansion of the existing footprint into adjacent areas; as such it is unlikely to substantially fragment habitat or impose a physical barrier to the movement of black cockatoos between the habitat within the Mine Development Envelope and surrounding habitat areas. Large, contiguous areas of native vegetation surround the Project which currently provide important habitat linkages to surrounding areas. Clearing for the Project is unlikely to significantly fragment the habitat available in the local area and/or regional area. Based on the mobility of the species and the availability of suitable habitat surrounding the Project, fragmentation of potential populations is considered unlikely. Criteria: Adversely affect habitat critical to the survival of a species. Response: Likely Reasoning: The Project will result in the removal of up to 385 ha of suitable Black Cockatoo habitat inclusive of 50 potential breeding trees with hollows. The habitat which will be removed from the Mine Development Envelope consists of habitat described in the species recovery plan as critical for the survival of black cockatoos (DEC 2008; DPAW 2013). However, as previously discussed, there is an estimated 68,440 ha of suitable Black Cockatoo foraging habitat within the Shire of Bridgetown-Greenbushes based on the current extent of Beard Vegetation Association 3 - Medium Forest; Jarrah-Marri) (GoWA, 2018a). The proposed habitat clearing is approximately 0.56% of the current extent of vegetation mapped as Beard Vegetation Association 3 - Medium Forest; Jarrah-Marri within the Shire of Bridgetown-Greenbushes and approximately 0.04% of the current extent remaining in the Southern Jarrah Forest (JAF02) bioregion (GoWA, 2018a). While the Project will adversely affect up to 385 ha of the species' critical habitat, this is a very small portion of the

Species	Impact
	available critical habitat within the local area and the region. It is also noted that the area of disturbance associated with the Greenbushes Lithium Mine has been progressively reduced from the initial 1984 mining disturbance footprint as a result of rehabilitation works undertaken by Talison and its predecessors over time. The area of disturbance required for the expanded mining footprint is approximately 10% less that the area of mining disturbance which was present in 1984. Criteria: Disrupt the breeding cycle of an important population. Response: Unlikely Reasoning: The nearest documented breeding sites of both Carnaby's and Forest Red tailed Black Cockatoos are 35 km to the north west at the Whicher Range. The nearest documented breeding site of Baudin's Cockatoo is 35 km to the south west in the Nannup area (Kirkby 2018). Of the 50 potential breeding trees with hollows within the Mine Development Envelope suitable for use by black cockatoos, 30 had chew marks indicating use by black cockatoos, although none were in use at the time of the survey (February 2018). The survey was undertaken outside of the main nesting periods of the three species, which are May/June and September-November for Forest Red-tailed Black Cockatoo; August-December for Baudin's Cockatoo and July-November for Carnaby's Cockatoo, although fledging can occur year-round for FRTBC, and into April and March for Baudin's and Carnaby's Cockatoos respectively. Only one hollow had recent chew marks. While there will be a loss of up to 50 potential breeding trees with hollows as a result of the mine expansion it is not likely that the impact will disrupt the breeding cycle of an important population of any of the black cockatoo species. The Mine Development Envelope is situated within State forest that comprises large expanses of the species critical habitat and there is estimated to be more than 50,000 ha of similar quality habitat in government-owned land within 15 km of the minesite (Ennovate, 2018). Where possible, clearing of vegetation will be timed so that it is undertaken outside of the known breeding seasons of the three species to ensure no

Species	Impact
	disruption occurs to any nesting birds or young. However where the operation timeframe dictates clearing within a breeding season, hollows will be checked prior to clearing by a suitably qualified 'fauna spotter'. Any that are in use by a nesting pair will be assessed for likely hollow persistence, generally 0-3 months for black cockatoos (from egg to fledging). If possible, the tree will be excluded from clearing until such time as the young have left the nest. If this is not possible, chick excavation (and subsequent hand-rearing, rehabilitation and release) will be carried out under the relevant permissions from DBCA. Criteria: Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline Response: Unlikely Reasoning: The Project will lead to a maximum direct loss of up to 385 ha of feeding and foraging habitat and 50 potential breeding trees with hollows. It is unlikely that this degree of clearing would lead to a decline in the species because the area of habitat that would be lost equates to only 0.56% of the current extent of vegetation association 3 within the Shire of Bridgetown Greenbushes and approximately 0.04% of the extent remaining within the Southern Jarrah Forest bioregion (GoWA, 2018a). No impact on habitat extent or quality outside of the clearing area is expected to result from the Project. The Project is an expansion of an existing facility that has been in operation for over 30 years. As extensive areas of quality habitat remain within the Mine Development Envelope and surrounding State Forest, and have done so for the mine's duration, it can be concluded that Talison's operations do not impact this habitat. In addition, Talison will implement appropriate mitigation measures to minimise/prevent impact on habitat outside the Mine Development Envelope, as per Section 4. Criteria: Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat Response: Unlikely Reasoning: The Project may potentially exacerbate existing invasive species (such as weeds and introduced predators) that already

Species	Impact
	occur within the Mine Development Envelope and surrounding areas if not appropriately managed. Cats and foxes are known to be a threat to native fauna, including black cockatoos. Additional to these vertebrate invasive fauna species the European Honey Bee has also been recorded within the Mine Development Envelope. European Honey Bees are listed as a threat to black cockatoos and other native fauna because of competition for tree hollows. The extent of these threats is expected to be similar within the Mine Development Envelope as they are in the surrounding State Forest. Talison implements annual fox and rabbit baiting and feral cat trapping as required. Other controls currently implemented by Talison that will minimise the likelihood of the establishment of new invasive species or the expansion of existing invasive species are: Weed Control Management; Dieback Management; and Vehicle Hygiene Procedures. These management controls will continue to be implemented as required throughout the expansion and operation of the mine (see Section 4 for more detail). The Project is an expansion of existing activities that have been occurring for over three decades. With appropriate controls, as described above and developed as required, the Project is unlikely to result in new invasive species becoming established, or existing species spreading within the Mine Development Envelope or surrounds to the extent that black cockatoos are substantially impacted. Criteria: Introduce disease that may cause the species to decline Response: Unlikely Reasoning: There is potential that the introduction/spread of Phytophthora Dieback could reduce the flora species diversity and density, and potentially impact on the habitat quality for black cockatoos. Dieback management controls will be implemented throughout the expansion and operation of the mine. Phytophthora Dieback is known to be present within the Mine Development Envelope and the surrounding State forest. Within the Mine Development Envelope, both the Jarrah/Marri Forest and Jarrah/Marri Forest over Banksia broad habitat

Species	Impact
	types are susceptible. Of the species within these habitat types that are important feeding and potential nesting resources for black cockatoos, the pathogen particularly impacts on Jarrah and Proteaceae (e.g Banksia) species. Marri has traditionally been assumed to be resistant to the pathogen however recent research indicates that seedlings (germinants) may be affected (Croeser et al.,2018). Prior to any ground disturbance activities, mapping of the Dieback status of vegetation will be carried out. Management protocols specific to the location and extent of infested and uninfested areas within the Mine Development Envelope will be established to prevent the spread of the pathogen, and prevent its introduction to previously uninfested areas. Existing management controls for known infested areas will continue to be implemented. Refer to Section 4 for more detail on Dieback management controls. The Project is unlikely to introduce a disease (e.g. beak and feather disease virus) that may cause the species to decline. There are no known diseases that may be introduced to the area that may cause the black cockatoo population to decline and it is unlikely that any disease already exists in the Mine Development Envelope that may be spread by the activities of the Project (as there has been no indication of any such disease). Criteria: Interfere substantially with the recovery of the species Response: Unlikely Reasoning: Carnaby's Black Cockatoo: The Project is unlikely to interfere substantially with the recovery of Carnaby's Black Cockatoo as it is unlikely to interfere with the recovery actions outlined in the Carnaby's cockatoo (Calyptorhynchus latirostris) Recovery Plan (DPAW 2013) for this species that is managed by DBCA. Actions in the Recovery Plan include: -protect and manage important habitat -conduct research to inform management -undertake regular monitoring -manage other impacts -undertake information and communication activities -engage with the broader community. Baudin's Black Cockatoo and Forest Red-tailed Black Cockatoo: The Project is unlikely to interfere substantially with the recovery of the

Species	Impact
	Baudin's Black Cockatoo and the Forest Red-tailed Black Cockatoo as it is unlikely to interfere with the recovery actions outlined in the Forest Black Cockatoo (Baudin's Cockatoo Calyptorhynchus baudinii and Forest Redtailed Black Cockatoo Calyptorhynchus banksii naso) Recovery Plan (DEC 2008). The Recovery Plan is managed by DBCA. Actions in the Recovery Plan include:: -seek the funding required to implement future recovery actions -determine and promote non-lethal means of mitigating fruit damage by Baudin's Black Cockatoo in orchards -eliminate illegal shooting -develop and implement strategies to allow for the use of noise emitting devices in orchards -determine and implement ways to remove feral Honeybees from nesting hollows -identify factors affecting the number of breeding attempts and breeding success and manage nest hollows to increase recruitment -determine and implement ways to minimise the effects of mining and urban development on habitat loss -determine and implement ways to manage forests for the conservation of Forest Black Cockatoos -identify and manage important sites and protect from threatening processes -map feeding and breeding habitat critical to survival and important populations, and prepare management guidelines for these habitats -monitor populations numbers and distribution -determine the patterns and significance of movement -maintain the Cockatoo care program and use other opportunities to promote the recovery of Forest Black Cockatoos
Western Ringtail Possum (Pseudocheirus occidentalis) - Vulnerable	The Mine Development Envelope falls within the Southern Forest Management Zone of the known distribution of the Western Ringtail Possum (DPaW, 2017). The Western Ringtail Possum has a known preference for Jarrah, Wandoo and Marri forest in inland localities (Biologic, 2018b). It feeds on the leaves of Jarrah and Marri trees in inland areas where such vegetation predominates. The species shelters in tree hollows in inland areas, with hollows providing up to 70% of the refugia available to the species in the Jarrah forests (DPaW, 2017). Large expanses of undisturbed habitat located in the north west and south east

Species	Impact
	of the Mine Development Envelope are likely to support the species (Biologic 2018b). Six records of Western Ringtail Possum have been recorded within the vicinity of the Mine Development Envelope (DBCA 2018). Two of these records are approximately 320 m north of the Mine Development Envelope from August and December 2014 (DBCA 2018). During a survey of the Mine Development Envelope by Biologic (2018b) scats likely belonging to Western Ringtail Possum (owing to their size and shape) were found in two locations in the north-western portion of the Mine Development Envelope. The scats could not be confirmed due to similarity with scats of the Common Brushtail Possum within this region of the State (Jarrah Forest vs. Peppermint Forest). The Common Brushtail Possum was abundant throughout the Mine Development Envelope (Biologic 2018b). Both potential Western Ringtail Possum scat collections were from Jarrah/Marri Forest habitat in the north-western portion of the Mine Development Envelope. Despite an extensive amount of survey effort, using both motion cameras and spotlighting, no individuals of the species were recorded in the Mine Development Envelope (Biologic 2018b). It is possible that the species occurs in the Mine Development Envelope in low numbers, or on a transient basis, as populations and resources fluctuate in the surrounding areas. Both the Jarrah/Marri Forest (of which there is 393 ha within the Mine Development Envelope) and Jarrah/Marri Forest over Banksia (of which there is 267 ha within the Mine Development Envelope) habitat types are likely to provide suitable habitat for the species, particularly in the north-western section of the Mine Development Envelope which adjoins a large block of undisturbed native forest (Biologic 2018b). Therefore, a total of 660.1 ha of suitable habitat for Western Ringtail Possum is present within the Mine Development Envelope. Of the 660.1 ha of available habitat, up to 385 ha will be cleared for the Project, comprised of approximately 208 ha of Jarrah/Marri Forest and 177 ha of Jarrah/Marri Forest over Banksia. Within the surrounding Talison tenement area,

Species	Impact
	Biologic mapped 4,086 ha of Jarrah/Marri Forest and 1,412 ha of Jarrah/Marri Forest over Banksia (Biologic, 2011). Of these total areas, the proportions that will be cleared equate to 5.1% and 12.5% respectively. About 85% of the vegetation within the Talison tenement area mapped by Biologic as the Jarrah/Marri Forest and Jarrah/Marri Forest over Banksia habitat types (2011) corresponds to the Dwellingup D1 and Catterick CC1 vegetation complexes of Mattiske & Havel (1998) as updated by Webb et al. (2016). The current extent of these complexes remaining within the Shire of Bridgetown Greenbushes is 4,533 ha and 8,482 ha respectively, totalling 13,015 ha. The proposed clearing of up to 385 ha of this vegetation equates to maximums of approximately 3.0% of the current extent within the Shire and 0.2% of the current extent remaining with the Darling Plateau subregion of the South West Forests (GoWA, 2018b). Significant Impact Guidelines An assessment of impacts on Western Ringtail Possum was undertaken against the Significant Impact Guidelines 1.1 (DotE 2013) as presented below. The assessment includes criteria for Vulnerable species. Criteria: Lead to a long-term decrease in the size of an important population of a species Response: Unlikely Reasoning: The presence of Western Ringtail Possums within the Mine Development Envelope could not be confirmed. Despite an extensive amount of survey effort, using both motion cameras and spotlighting, no individuals of the species were recorded in the Mine Development Envelope. 660.1 ha of suitable habitat for Western Ringtail Possum is present within the Mine Development Envelope, and 5,498 ha remains within the Talison tenement area. Of these extents, up to 385 ha will be directly lost through clearing. As the species is known to occur in the general region based on DBCA records, and given suitable habitat exists, it is possible the species occurs in the Mine Development Envelope in low numbers or on a transient basis. However based on available evidence, the Mine Development Envelope is not considered to represent habitat

Species	Impact
	of significance for the species in the area. It is therefore very unlikely that Mine Development Envelope would be utilised by an 'important population' or that clearing of it will result in a long term decrease in the size of an 'important population' of Western Ringtail Possums. Criteria: Reduce the area of occupancy of an important population Response: Unlikely Reasoning: The Project is unlikely to substantially reduce the area of occupancy of the Western Ringtail Possum within the local area or region. This species is generally confined to five regional locations, the near-coastal area between Bunbury and Augusta, the south coast between Walpole and Albany, the lower Collie River Valley, Harvey River and the Perup Nature Reserve and the surrounding forest blocks near Manjimup (DPaW, 2017). Despite significant survey effort, the presence of Western Ringtail Possums within the Mine Development Envelope could not be confirmed although the species was recorded in 2014 ~320 m north of the Mine Development Envelope in native vegetation that continues into the Mine Development Envelope (Biologic, 2018b). The species may be present in low numbers or on a transient basis but it is very unlikely that the Mine Development Envelope supports an 'important population'. As such, while the proposed clearing will result in a loss of suitable habitat, it is unlikely to reduce the area of occupancy of an 'important population'. Criteria: Fragment an existing important population into two or more populations Response: Unlikely Reasoning: Despite significant survey effort, the species' presence within the Mine Development Envelope was not confirmed and as such it is very unlikely that an 'important population' of the species is present. Both scat locations were recorded in the northwest of the Mine Development Envelope, in an area of vegetation that adjoins a large block of undisturbed native forest, with one being very close to the Mine Development Envelope boundary. The proposed clearing is associated with the expansion of existing disturbance areas and is not likely to result in the fragmentation of existing habitat areas.

Species	Impact
	Considering that, if the species is present, it is likely to be in low numbers or on a transient basis as populations and resources fluctuate in the surrounding areas (Biologic, 2018b), the proposed clearing is unlikely to fragment an 'important population' of the species. Criteria: Adversely affect habitat critical to the survival of a species Response: Unlikely Reasoning: Critical habitat for the Western Ringtail Possum in the Southern Forests Management Zone is described as 'forests with limited anthropogenic disturbance (unlogged or lightly logged, and a low intensity and low frequency fire history), that are intensively fox-baited and have low indices of fragmentation' (DPaW, 2017). Data from Onshore Environmental's 2011 flora and vegetation survey indicates that 22 of 26 floristic quadrat locations distributed throughout the Talison tenement area had been burnt within the previous 10 years (Onshore Environmental 2012). 17 had evident disturbance from past logging activity and all were impacted to some degree by other anthropogenic disturbances such as weeds and tracks. The broader Greenbushes area, including State Forest areas and the Mine Development Envelope, has been subject to mining activity since the late 1800's. Historically this was an additional cause of disturbance, evidence and or impacts of which often remain today. Of the 7 sites located within vegetation in the Mine Development Envelope that will be cleared for the Project, 86% had been burned within the previous 10 years. This does not constitute a 'low frequency' fire history. The same proportion showed evidence of disturbance from past logging activities, and all showed evidence of other anthropogenic disturbances such as weeds and tracks, the latter in part a result of the long history of mining and other disturbance. Talison carries out an annual fox baiting program with supplementary baiting as required but this is not considered to be 'intensive'. Vegetation within the Mine Development Envelope is relatively fragmented, being made up of 10 or 11 main 'blocks' of vegetation (Kirkby, 2018). However many of these are substantial in area and would

Species	Impact
	not be considered fragmented at a local scale. Therefore while the Project will result in the loss of up to 385 ha of potential Western Ringtail Possum habitat, it would not be likely to qualify as critical habitat as defined in the species Recovery Plan. In addition, as the species is not confirmed as occurring within the area, the proposed clearing is not likely to affect the survival of the species. Substantial similar potential habitat is present within the surrounding State forest, and within the Talison tenement area. Criteria: Disrupt the breeding cycle of an important population Response: Unlikely Reasoning: The proposed clearing is unlikely to disrupt the breeding cycle of the Western Ringtail Possum. While this species is known to occur within the region, the area is not considered core breeding habitat or habitat that is a component of, or wholly habitat for an important population for this species. A combined total of 5,498 ha of the Jarrah/Marri Forest and Jarrah/Marri Forest over Banksia habitat types that are considered potential habitat for the species occurs within the Talison tenement area (Biologic, 2011), of which up to 385 ha, or 7% will be cleared. It is considered very unlikely that the Project will disrupt the breeding cycle of an important population. Criteria: Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline Response: Unlikely Reasoning: While the Project will result in clearing of up to 385 ha of potential Western Ringtail Possum habitat, it is very unlikely to result in the species declining. Based on available evidence, if the species is present within the Mine Development Envelope, it is in very low numbers or on a transient basis. The surrounding area contains large tracts of similar potential habitat to that which will be lost under the Project. Of the three Management Areas (separate zones where the species occurs) identified in the species' Recovery Plan (DPaW, 2017), the highest densities of the western ringtail possum occur on the Swan Coastal Plain and South Coast areas. The Southern Forests Area, while once a major stronghold, no longer supports the species in

Species	Impact
	high numbers. As such, the loss of up to 385 ha of potential suitable habitat within the Southern Forests, that is not confirmed to support a local population of the species, is not likely to result in any impact on the survival of the species. Criteria: Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat Response: Unlikely Reasoning: The Project may potentially exacerbate existing invasive species (such as weeds and introduced predators) that already occur within the Mine Development Envelope and surrounding areas if not appropriately managed. Cats and foxes are known to be a threat to native fauna, including Western Ringtail Possum. Additional to these vertebrate invasive fauna species, the European Honey Bee has also been recorded within the Mine Development Envelope. European Honey Bees are listed as a threat to native fauna because of competition for tree hollows. The extent of these threats is expected to be similar within the Mine Development Envelope as they are in the surrounding State forest, especially considering the availability of water. Talison implements annual fox and rabbit baiting and feral cat trapping as required. Other controls currently implemented by Talison that will minimise the likelihood of the establishment of new invasive species or the expansion of existing invasive species infestations/presence are: -Weed Control Management; -Dieback Management; and -Vehicle Hygiene Procedures These management controls will continue to be implemented as required throughout the expansion and operation of the mine (see Section 4 for more detail). The Project is an expansion of existing activities that have been occurring for over three decades. With appropriate controls, as described above and developed as required, the Project is unlikely to result in new invasive species becoming established, or existing species spreading within the Mine Development Envelope or surrounds to the extent that Western Ringtail Possums are substantially impacted. Criteria: Introduce disease that may cause the species to decline Response:

Species	Impact
	Unlikely Reasoning: Western Ringtail Possums can be at a greater risk of disease due to human disturbance and exposure to exotic species and pathogens (DPaW, 2017). Cat predation may also expose the species to toxoplasmosis infection. Feral cats are already present within the Mine Development Envelope and surrounding State forest, and trapping is carried out by Talison as required. As the Project comprises the expansion of an existing facility that has been in place and in operation for more than 30 years, it is not likely that a disease would be introduced that could cause Western Ringtail Possums to decline, particularly considering that the species has not been confirmed as being present on site. The Western Ringtail Possum is unlikely to be exposed to any additional diseases (that do not currently occur in that environment) as a result of the Project. It is considered unlikely that the project would introduce diseases that may cause the Western Ringtail Possum population to decline. Phytophthora Dieback is known to be present within the Mine Development Envelope and the surrounding State forest. Within the Mine Development Envelope, both the Jarrah/Marri Forest and Jarrah/Marri Forest over Banksia broad habitat types - both of which constitute potential habitat - are susceptible. There is potential that the introduction/spread of Phytophthora Dieback could reduce the flora species diversity and density, and potentially impact on the habitat quality for Western Ringtail Possums. Of the species within these habitat types that are important for Western Ringtail Possums, the pathogen particularly impacts on Jarrah. Marri has traditionally been assumed to be resistant to the pathogen however recent research indicates that seedlings (germinants) may be affected (Croeser et al.,2018). Dieback management controls will be implemented throughout the expansion and operation of the mine. Prior to any ground disturbance activities, mapping of the Dieback status of vegetation will be carried out. Management protocols specific to the location and extent of infested and uninfested areas within the Mine Development

Species	Impact
	Envelope will be established to prevent the spread of the pathogen, and prevent its introduction to previously uninfested areas. Existing management controls for known infested areas will continue to be implemented. Refer to Section 4 for more detail on Dieback management controls. Criteria: Interfere substantially with the recovery of the species Response: Unlikely Reasoning: The clearing that is required to facilitate the Project is not likely to interfere substantially with the recovery of the species because it does not substantially compromise any of the actions specified in the species' Recovery Plan. The Recovery Plan is managed by DBCA. Some of the relevant actions listed in the Plan are: Identify and implement effective strategies to achieve the protection of higher ranked habitat, on public and private land, in each of the key management areas Utilise and enhance species distribution modelling to identify refuges or future suitable habitat to mitigate the climate pressures Work with fire management agencies to implement improved fire management strategies Implement management strategies to minimise, or compensate for the impacts of disease, pathogens or insects that are likely to impact habitat quality Implement effective, integrated introduced predator control programs on DPaW managed land and seek to have a coordinated approach to control of introduced predators across different land tenures to maximise effectiveness In accordance with other management strategies, develop and implement control measures for hollow-using introduced pest species where identified as a threat. While the Mine Development Envelope contains potential habitat for the Western Ringtail Possum the species was not confirmed as being present. The nearest confirmed record is from 2014, located ~320 m to the north. As the Mine does not support a confirmed population or 'important population' it is very unlikely that the proposed clearing of up to 385 ha of potential habitat will interfere with the recovery of the species. Outcome - The project is unlikely to have a significant impact on Western Ringtail Possums.

Species	Impact
Western Quoll/Chuditch (Dasurus geoffroii) - Vulnerable	Now present in approximately 5% of their former range, most Chuditch are found in varying densities throughout the Jarrah Forest and South Coast of Western Australia. They also occur at lower densities in the Goldfields and Wheatbelt, as well as in Kalbarri National Park (translocated) (DEC, 2012). The Mine Development Envelope falls within the distribution of the Chuditch. Thirty-five records of the Chuditch have been recorded within the vicinity of the Mine (DBCA 2018). One, from 1987, is located 577 m north of the Mine Development Envelope. The remaining 34 records are within approximately 21 km, with the majority from north of the Mine (DBCA, 2018). Chuditch use a range of habitats including forest, mallee shrublands, woodland and desert. The most dense populations have been found in riparian Jarrah Forest (DEC, 2012). The Mine Development Envelope contains preferred habitats of the species and is located well within the species core-range. During the recent survey by Biologic (2018b), 21 records of Chuditch were recorded on five motion cameras set in a single targeted transect in the north-western portion of the Mine Development Envelope. Visually comparing spot patterning, it appears the captures may represent a single individual; however, a mark-capture-recapture survey would need to be conducted to confirm this and determine the population inhabiting the local area (Biologic 2018b). The survey was undertaken prior to the mating season (April to July), extinguishing the possibility that records represent transient or passing individuals. This is further supported by the number and frequency of the records obtained. All records were from the same site (Site 01) and potentially represented a single individual – although this is not confirmed. Both the Jarrah/Marri Forest (208 ha) and Jarrah/Marri Forest over Banksia (177 ha) habitat types within the Mine Development Envelope provide suitable habitat for the species. Given the species typically large home-range (3 - 15 km2 for males and females respectively), it is possible that the species may occur throughout the Mine Development

Species	Impact
	Envelope. However, it appears that within the Mine Development Envelope, the north-west portion, which adjoins a several waterbodies (Cowan Dam, Southampton Dam and Austin's Dam) and portion of undisturbed forest, provides preferred habitat for individuals. This area is also connected to the Schwenkes area which may be a preferred habitat of the species due to availability of prey. The Shwenkes area is a historic mining void which has been converted into an artificial wetland area by the Blackwood Basin Group with the aim of attracting wetland species, primarily birds, to the area (Christensen 2016). Land clearing is currently seen as the largest impact to the species and any development within the Mine Development Envelope would potentially impact the local population (Biologic, 2018b). As a result of the Project, should appropriate controls not be implemented, loss or injury of fauna during clearing or as a result of vehicle and/or equipment strikes is possible, along with fauna entrapment in excavated pits and trenches. Significant Impact Guidelines An assessment of impacts on Chuditch was undertaken against the Significant Impact Guidelines 1.1 (DotE 2013) as presented below. The assessment includes criteria for Vulnerable species. Criteria: Lead to a long-term decrease in the size of an important population of a species Response: Unlikely Reasoning: The Mine Development Envelope contains 660.1 ha of suitable habitat for Chuditch (Biologic, 2018b). The Project will result in the direst loss through clearing of up to 385 ha of Chuditch habitat, comprised of 208 ha of Jarrah/Marri Forest 177 ha of Jarrah/Marri Forest over Banksia. A combined total of 5,498 ha of the Jarrah/Marri Forest and Jarrah/Marri Forest over Banksia habitat types that are considered potential habitat for the species occurs within the Talison tenement area (Biologic, 2011), of which up to a maximum of 7% will be cleared. About 85% of the vegetation within the Talison tenement area mapped by Biologic as the Jarrah/Marri Forest and Jarrah/Marri Forest over Banksia habitat types (2011) corresponds to the Dwellingup D1 and Catterick CC1 vegetation complexes of

Species	Impact
	Mattiske & Havel (1998) as updated by Webb et al. (2016). The current extent of these complexes remaining within the Shire of Bridgetown Greenbushes is 4,533 ha and 8482 ha respectively, totalling 13,015 ha. The proposed clearing of up to 385 ha of this vegetation equates to maximums of approximately 3.0% of the current extent within the Shire and 0.2% of the current extent remaining with the Darling Plateau subregion of the South West Forests (GoWA, 2018b). While Chuditch were recorded within the Mine Development Envelope during the 2018 survey, visually comparing spot patterning, it appears the records may represent a single individual, although this was not confirmed. All records were from a single transect placed in vegetation in the northwest of the Mine Development Envelope that adjoins a large tract of similar native vegetation in State Forest. The records were taken 130 m from the boundary between the Mine Development Envelope and State Forest. Chuditch have large home ranges of between 3 km2 (female) and 15 km2 (male) (DEC, 2012). As such, it is unlikely that the records from the 2018 survey indicate the presence of an ‘important population’ of Chuditch within the Mine Development Envelope. Considering the available species data and the extent of similar habitat within the local area and the region, the loss of up to 385 ha of habitat within the Mine Development Envelope is not likely to lead to a long-term decrease in the size of an important population of a species. Reduce the area of occupancy of an important population Response: Unlikely Reasoning: A combined total of 5,498 ha of the Jarrah/Marri Forest and Jarrah/Marri Forest over Banksia habitat types that are considered potential habitat for the species occurs within the Talison tenement area (Biologic, 2011), of which up to a maximum of 385 ha or 7% will be cleared. A substantial amount of vegetation likely to be similar value habitat is present within the local area and the region, with more than 13,000 ha in the Shire of Bridgetown Greenbushes (GoWA, 2018b). Chuditch was observed during the 2018 fauna survey

Species	Impact
	(Biologic, 2018b), recorded on five motion cameras set in a single targeted transect in the north-western portion of the Mine Development Envelope. It appears that the records were from one resident individual however this was not confirmed. The species was recorded from Mine Development Envelope vegetation that adjoins a large expanse of State forest, both of which are mapped as the same vegetation complexes (Dwellingup D1 and Catterick CC1) (Webb et al., 2016). This indicates that the surrounding State forest vegetation would provide similar habitat to that within the Mine Development Envelope. Of the suitable habitat, the Chuditch's preferred habitat is riparian vegetation, of which little is present within the Mine Development Envelope. Talison do not intend to clear or disturb riparian vegetation as part of the proposed expansion. The Mine Development Envelope is located within the known distribution of Chuditch and contains a substantial amount of the species' suitable habitat. However, based on the number of records of the species taken during the 2018 survey, it is unlikely that the Mine Development Envelope supports an 'important' Chuditch population. Therefore it is unlikely that the Project will reduce the area of occupancy of an important population. Criteria: Fragment an existing important population into two or more populations Response: Unlikely Reasoning: Based on an assessment of available data and records from the 2018 survey (Biologic, 2018b), it is unlikely that the Mine Development Envelope supports an 'important population' of Chuditch. Records taken during the survey indicate that it is possible only one individual of the species is present, however this was not confirmed. While the proposed clearing could potentially impact habitat within the home range of this individual(s), this individual (or individuals) is unlikely to be an 'important population', as defined in the Significant Impact Guidelines 1.1 (DotE 2013). The Mine Development Envelope is located well within the species core-range, and no populations of Chuditch within or near to the Mine Development Envelope have been identified as

Species	Impact
	key source populations or populations necessary for the maintenance of genetic diversity. While the Project will result in the loss of up to 385 ha of the species' habitat, the proposed clearing is associated with the expansion of existing disturbance areas and is not likely to result in the fragmentation of existing habitat areas. Criteria: Adversely affect habitat critical to the survival of a species Response: Likely Reasoning: Habitats critical to Chuditch survival and maintenance of important populations comprise: • Areas currently occupied by Chuditch; • Areas of natural vegetation in which Chuditch breed; • Areas of natural vegetation in which Chuditch forage; • Areas of natural vegetation that Chuditch use to move from one area to another; • Areas of suitable vegetation within the recorded range in which undiscovered Chuditch populations may exist; • Areas not currently occupied by Chuditch due to recent fire but are capable of supporting Chuditch populations when sufficiently recovered; and • Areas previously occupied and that still provide suitable habitat and into which Chuditch can be reintroduced (DEC, 2012). Based on the above, the vegetation in the north west of the Mine Development Envelope that will be cleared for the Project constitutes critical habitat for the species because the species is known to occupy and or move through this vegetation. The Project will have a limited clearing footprint within the north west section of the Mine Development Envelope where the Chuditch has been recorded (<5 ha). Only relatively passive infrastructure (explosive storage/handling infrastructure and access tracks) with a small footprint is planned within this area, The north west section of the Mine Development Envelope is also linked to the Schwenkies wetland area, previously mentioned, which is also likely to be a preferred habitat of the species due to the abundance of prey likely to occur in the area. The vegetation in the remainder of the Mine Development Envelope may be critical habitat as it may support undiscovered Chuditch populations (however based on the significant survey effort expended

Species	Impact
	in the 2018 survey (Biologic, 2018b) to locate the species, this is unlikely). An estimated 660.1 ha of vegetation within the Mine Development Envelope is considered to be suitable habitat for the species. While it has not been confirmed that the species previously occurred within other areas of the Mine Development Envelope, it is likely, based on the species' historical distribution (DEC, 2012). DEC (2012) further state, in regard to the species' critical habitat: 'Chuditch are capable of travelling long distances and have large home ranges, and even at their most abundant, they are generally present in low numbers. For this reason they require habitats that are of a suitable size and not excessively fragmented'. Vegetation within the Mine Development Envelope is relatively fragmented, being made up of 10 or 11 main 'blocks' of vegetation between 30 ha and 159 ha (Kirkby, 2018). While these are not fragmented at a local scale, in relation to the size of the Chuditch's home ranges of 1500 ha for males and 300 ha for females, they do not provide large enough areas to support an individual. Chuditch were only recorded from one 'block' of vegetation; the largest and the one that adjoins State Forest (Biologic, 2018b). Therefore, considering these factors in combination with the location of the record from the 2018 survey, it is likely that the surrounding and adjoining extensive tracts of State Forest vegetation and that within the Talison tenement area provide more significant vegetation than that within the Mine Development Envelope. Therefore while the Project will result in the loss of up to 385 ha of suitable Chuditch habitat, not all may qualify as critical habitat as defined in the species Recovery Plan. Chuditch were recorded from only one of the 'blocks' of vegetation within the Mine Development Envelope, the largest (159 ha). According to the species' Recovery Plan, this block would constitute critical Chuditch habitat because Chuditch are known to occur there (Biologic, 2018b). Only limited clearing (<5 ha) for explosive infrastructure and access tracks is planned within the area the Chuditch has been recorded occurring within. Criteria:

Species	Impact
	Disrupt the breeding cycle of an important population Response: Unlikely Reasoning: A combined total of 5,498 ha of the Jarrah/Marri Forest and Jarrah/Marri Forest over Banksia habitat types that are considered potential habitat for the Chuditch occurs within the Talison tenement area (Biologic, 2011), of which up to 385 ha, or 7% will be cleared. Based on the available data from the 2018 survey (Biologic, 2018b), it is possible that the Mine Development Envelope only supports one individual of the species, however further survey would be required to confirm this. No evidence of previous breeding or nesting in the form of log dens or burrows was observed during the survey. The Mine Development Envelope is unlikely to contain an ‘important’ population of the species. The Mine Development Envelope is located well within the species core-range, and no populations of Chuditch within or near to the Mine Development Envelope have been identified as key source populations or populations necessary for the maintenance of genetic diversity. As the surrounding area contains substantial amount of habitat similar to that within the Mine Development Envelope, it is unlikely that the loss of up to 385 ha from the local area will impact the breeding cycle of the local individual(s), as any individuals utilising vegetation in the Mine Development Envelope can relocate to vegetation in the surrounding areas. Chuditch was recorded from one ‘block’ of vegetation in the north west of the Mine Development Envelope that is contiguous with vegetation in the surrounding State Forest. Therefore while the loss of the vegetation within this ‘block’ may alter the configuration of the individual(s)’ home range, it is unlikely to impact beyond that. Prior to clearing, a suitably qualified fauna ‘spotter’ would be engaged to encourage any resident or present fauna to relocate outside of the clearing area. Where possible, clearing would be undertaken outside of the species known breeding season (May to October), and in particular outside of the period when young are deposited in dens/burrows, which is usually from July to October. Should

Species	Impact
	this not be possible, any young found to be present within the clearing area would be excavated from the den/burrow and placed with a carer for rearing and future release back into the wild. As the individual(s) observed during the 2018 survey do not constitute an important Chuditch population the proposed clearance of up to 385 ha of suitable habitat for the species is not likely to disrupt the breeding cycle of an important population. Criteria: Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline Response: Unlikely Reasoning: The Mine Development Envelope is located within the Chuditch's known distribution area. The major portion of the remaining natural populations of the species occur in Jarrah forests and woodlands in the South-West of WA, and in woodlands, mallee shrublands and heaths along the South Coast, east to the Ravensthorpe area (DEC, 2012). It is possible that the population utilising the Mine Development Envelope consists of one individual, although this was not confirmed. The species was recorded in vegetation in the north west of the Mine Development Envelope that is adjacent to a large water body and a large tract of State Forest vegetation. The surrounding Talison tenement area contains 5,498 ha of habitat suitable for Chuditch, of which up to 385 ha or 7% will be cleared. Approximately 85% of the vegetation within the tenement area that qualifies as suitable habitat is mapped as the Dwellingup D1 and Catterick CC1 vegetation complexes of Mattiske and Havel (1998) as updated by Webb et al., 2016. Within the Shire of Bridgetown-Greenbushes, 4,533 ha and 8,482 ha of these complexes remains, respectively, totalling 13,015 ha. The proposed clearing of up to 385 ha of this vegetation equates to maximums of approximately 3.0% of the current extent within the Shire and 0.2% of the current extent remaining with the Darling Plateau subregion of the South West Forests (GoWA, 2018b). Prior to clearing, a suitably qualified fauna 'spotter' would be engaged to encourage any resident or present fauna, including Chuditch, to relocate outside of the

Species	Impact
	clearing area. A fauna spotter will also be engaged during clearing to minimise the risk of fauna injury or death (see Section 4 for more information). With the implementation of these management controls, no Chuditch deaths are likely to result from the Project. The local 'population' would naturally relocate to surrounding habitat areas. The loss of up to 385 ha of suitable species' habitat from the Mine Development Envelope is unlikely to result in the decline of the species. Criteria: Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat Response: Unlikely Reasoning: The project may potentially exacerbate existing invasive species (such as weeds and introduced predators) that already occur within the Mine Development Envelope and surrounding areas if not appropriately managed. Predation by, and competition from, foxes and feral cats is a known threat to Chuditch (DEC, 2012). The extent of these threats is expected to be similar within the Mine Development Envelope as they are in the surrounding State Forest, especially considering the similar availability of water. Talison implements annual fox and rabbit baiting and feral cat trapping as required. Other controls currently implemented by Talison that will minimise the likelihood of the establishment of new invasive species or the expansion of existing invasive species infestations/presence are: -Weed Control Management; -Dieback Management; and -Vehicle Hygiene Procedures These management controls will continue to be implemented as required throughout the expansion and operation of the mine (see Section 4 for more detail). The Project is an expansion of existing open cut mining activities that have been occurring for over three decades. With appropriate controls, as described above and developed as required, the Project is unlikely to result in new invasive species becoming established, or existing species spreading within the Mine Development Envelope or surrounds to the extent that Chuditch are substantially impacted. Criteria: Introduce disease that may cause the species

Species	Impact
	to decline Response: Unlikely Reasoning: There is potential that the introduction/spread of Phytophthora Dieback could reduce the flora species diversity and density, and potentially impact on the habitat quality for Chuditch. Dieback management controls will be implemented throughout the expansion and operation of the mine. Phytophthora Dieback is known to be present within the Mine Development Envelope and the surrounding State Forest. Within the Mine Development Envelope, both the Jarrah/Marri Forest and Jarrah/Marri Forest over Banksia broad habitat types are susceptible. Prior to any ground disturbance activities, mapping of the Dieback status of vegetation will be carried out. Management protocols specific to the location and extent of infested and uninfested areas within the Mine Development Envelope will be established to prevent the spread of the pathogen, and prevent its introduction to previously uninfested areas. Existing management controls for known infested areas will continue to be implemented. Refer to Section 4 for more detail on Dieback management controls. As the Project comprises the expansion of an existing facility that has been in place and in operation for more than 30 years, it is not likely that a disease would be introduced that could cause Chuditch to decline. The Chuditch is unlikely to be exposed to any additional diseases (that do not currently occur in that environment) as a result of the Project. Criteria: Interfere substantially with the recovery of the species Response: Unlikely Reasoning: The clearing that will be required to facilitate the Project is unlikely to interfere substantially with the recovery of the Chuditch although it does compromise one of the actions specified in the species' Recovery Plan, which is to: • Retain and improve habitat critical for survival The Mine Development Envelope contains a 159 ha block of critical Chuditch habitat as defined in the species' Recovery Plan, classified as such because Chuditch are known to occur there (Biologic, 2018b). This block is located in the north west of the Envelope adjoining State Forest vegetation.

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	The remaining 501.1 ha of suitable habitat may also qualify as critical habitat because it is likely that Chuditch once occurred there, and it may support undiscovered Chuditch populations (however based on the significant survey effort expended in the 2018 survey (Biologic, 2018b) to locate the species, this is unlikely). Under the Project, up to 385 ha of suitable and potentially critical species habitat will be cleared. This equates to 8% of the extent of similar habitat within the Talison tenement area (Biologic, 2011) and approximately 3.0% of the current extent within the Shire of Bridgetown Greenbushes (GoWA, 2018b). Additionally, only a small area of clearing (<5 ha), for explosive infrastructure and access, is planned within the area the Chuditch has been recorded within, the majority of this area will therefore remain undisturbed by the mine expansion, Considering this, and the large home ranges of the Chuditch of between 300 ha and 1500 ha for females and males respectively, it is unlikely that the proposed clearing would interfere substantially with the recovery of the Chuditch. Outcome – The project is likely to have a significant impact on Chuditch.
Quokka (Setonix brachyurus) - Vulnerable	The Quokka occurs on two offshore islands (Rottnest Island and Bald Island) and a number of mainland sites in South Sest WA, ranging from just south of Perth to the Hunter River (DoEE, 2018). The distribution of this species is severely fragmented and there is little to no migration between populations. According to the species' Recovery Plan (DEC, 2013), the Mine Development Envelope is located within the Northern Forests distribution area for the species, which extends from immediately east and north-east of the Perth metropolitan area to Collie. Distribution appears to be discontinuous from Collie to Nannup despite continuous forest habitat (DEC, 2013). Habitat requirements vary between the populations. Critical habitat for the Northern Forests populations comprises Taxandria linearifolia swamps. Habitat critical to survival includes areas of natural vegetation where the understorey is sufficiently thick and complex to provide a predation refuge close to more open, recently burnt vegetation which is

Species	Impact
	used as a food source (DEC, 2013). While the main habitat for mainland populations constitutes dense riparian vegetation, Quokka also use heath and shrubland, Swamp Peppermint (Taxandria linearifolia) dominated swamps in Jarrah forest, swampy shrublands, swordgrass-dominated understorey, regrowth areas of the Karri forest, Bullich (Eucalyptus megacarpa) swamp forest and Paperbark (Melaleuca spp.) swamp. Forty-three records of Quokka have been recorded within the vicinity of the Mine Development Envelope (DBCA 2018). The nearest records were captured approximately 10.5 km, 11.1 km, 11.8 km and 12.3 km south-west of the Mine Development Envelope from December 2004, April 2005, February 2005 and April 2005 respectively (DBCA 2018). The Quokka was not recorded within the Mine Development Envelope during the recent survey by Biologic (2018b) despite the extensive amount of survey effort. Nor was it recorded within the Talison tenement area in the 2011 survey (Biologic, 2011). All natural habitats with the Study Area provide potential habitat for the species, however favoured habitats with a dense understorey, like that which occurs in natural wetlands, does not occur within the Mine Development Envelope. Other preferred habitat of woodlands and shrublands with a dense vegetated understorey is not overly abundant within the Mine Development Envelope. Therefore it is unlikely that the species will reside within the Mine Development Envelope permanently, although may occasionally occur while dispersing through the landscape. Based on the above, it is unlikely that development within the Mine Development Envelope will severely impact the local population of the species if present (Biologic 2018b). Significant Impact Guidelines An assessment of impacts on Quokka was undertaken against the Significant Impact Guidelines 1.1 (DotE 2013) as presented below. The assessment includes criteria for Vulnerable species. Criteria: Lead to a long-term decrease in the size of an important population of a species Response: Unlikely Reasoning: No individuals or evidence of their

Species	Impact
	presence within the Mine Development Envelope were observed during the 2018 survey (Biologic, 2018b) or within the Talison tenement area during the 2011 survey (Biologic, 2011). The Mine Development Envelope does not contain an 'important' population of Quokkas as defined in the Significant Impact Guidelines 1.1 (DotE 2013). While the Mine Development Envelope contains vegetation that may be suitable habitat for quokkas, it does not contain the species' preferred or critical habitat. Little vegetation with a dense understorey, which is preferred by the species, and none of the preferred Taxandria linearifolia swamps, are present within the Mine Development Envelope. Additionally, the species is known to prefer riparian vegetation located along waterways or around wetlands, where it is provided protection from predators and heat (DEC, 2013). There is approximately 8 ha of riparian vegetation within the Mine Development Envelope. Talison do not intend to clear or cause disturbance within this riparian vegetation. As such, should the species reside or occasionally be present there, it is not likely to be impacted by the Project. In the Northern (Jarrah) Forests, the species is also known to require a complex mosaic of recently burnt areas and long unburnt areas. According to Onshore Environmental's 2011 survey (Onshore Environmental, 2012), of the 7 floristic quadrats assessed within the Mine Development Envelope, 2 had been burned within the previous 1-2 years, 4 within the previous 5-10 years and only one had not been burned for more than 10 years. 10 years without fire is not considered 'long unburnt' (Bain, 2015). The Mine Development Envelope comprises vegetation of different fire-ages but is not likely to provide the complex fire-age mosaic required by the Quokka. Hayward et al. (2007) also found that the intensity of control of introduced foxes was an important factor in determining occupancy of habitats by Quokkas in the Northern Jarrah Forest. Quokkas were more likely to be present in habitats with a more intensive baiting regime, which at the time of Hayward et al.'s study equated to monthly

Species	Impact
	baiting (Bain, 2015). Based on the descriptions of the species' preferred and critical habitats, it is very unlikely that the species is present within the Jarrah/Marri Forest or Jarrah/Marri Forest over Banksia habitat types which constitute the proposed clearance area. Therefore the Project is unlikely to lead to a long-term decrease in the size of an important population of a species. Criteria: Reduce the area of occupancy of an important population Response: Unlikely Reasoning: No individuals or evidence of their presence within the Mine Development Envelope were observed during the 2018 survey (Biologic, 2018b) or within the Talison tenement area during the 2011 survey (Biologic, 2011). The Mine Development Envelope does not contain an 'important' population of Quokkas. Vegetation within the Mine Development Envelope does not provide the dense understorey layer and complex fire-age mosaic required by Quokkas. The vegetation within the Mine Development Envelope most likely to support Quokka is riparian and wetland vegetation. A small amount (~8 ha) of riparian vegetation is present in the west of the Mine Development Envelope. Talison do not intend to clear or cause disturbance within this riparian vegetation. As such, should the species reside or be occasionally present there, it is not likely to be impacted by the Project. Based on the descriptions of the species' known preferred and critical habitats, it is very unlikely that the species is present within the Jarrah/Marri Forest or Jarrah/Marri Forest over Banksia habitat types which constitute the proposed clearance area. Therefore the Project is unlikely to lead to a long-term decrease in the size of an important population of a species. Criteria: Fragment an existing important population into two or more populations Response: Unlikely Reasoning: All natural habitats with the Mine Development Envelope provide potential habitat for the species, although favoured habitats with a dense understorey, like that which occurs in natural wetlands, does not occur. Therefore, it is unlikely that the species will reside permanently within the Mine Development

Species	Impact
	Envelope, although may occasionally occur while dispersing through the landscape (Biologic, 2018b). Despite significant survey effort, the Quokka was not recorded within the Mine Development Envelope during the 2018 survey (Biologic, 2018b), or within the Talison tenement area during the 2011 survey (Biologic, 2011). The Mine Development Envelope does not contain an 'important' Quokka population. As such, the Project is unlikely to result in the fragmentation of an existing important population into two or more populations. Criteria: Adversely affect habitat critical to the survival of a species Response: Unlikely Reasoning: Critical habitat for Quokkas in the Northern Jarrah Forests is well defined. It comprises Taxandria linearifolia swamps and includes areas of natural vegetation where the understorey is sufficiently thick and complex to provide a predation refuge close to more open, recently burnt vegetation which is used as a food source (DEC, 2013). While the main habitat for mainland populations constitutes dense riparian vegetation, Quokka also use heath and shrubland, Swamp Peppermint (Taxandria linearifolia) dominated swamps in Jarrah forest, swampy shrublands, swordgrass-dominated understorey, regrowth areas of the Karri forest, Bullich (Eucalyptus megacarpa) swamp forest and Paperbark (Melaleuca spp.) swamp. Favoured habitats with a dense understorey do not occur within the Mine Development Envelope, therefore it is unlikely that the species will reside there permanently, although it may occasionally occur while dispersing through the landscape (Biologic, 2018b). As the species' critical habitat does not occur within the Mine Development Envelope, the Project is unlikely to adversely affect habitat critical to the survival of a species. Criteria: Disrupt the breeding cycle of an important population Response: Unlikely Reasoning: Despite significant survey effort, the Quokka was not recorded within the Mine Development Envelope during the 2018 survey (Biologic, 2018b), or within the Talison tenement area during the 2011 survey (Biologic, 2011). The Mine Development Envelope does not contain

Species	Impact
	an ‘important’ Quokka population. Quokkas breed throughout the year on the mainland (DEC, 2013). They carry their young in pouches and do not require specific nesting or breeding habitat. Regardless, vegetation within the Mine Development Envelope does not provide the dense understorey layer and complex fire-age mosaic characteristic of the Quokkas required habitat. The vegetation within the Mine Development Envelope most likely to support Quokka is riparian and wetland vegetation. A small amount (~8 ha) of riparian vegetation is present in the west of the Mine Development Envelope. Talison do not intend to clear or cause disturbance within this riparian vegetation. As such, should the species reside or be occasionally present there, it is not likely to be impacted by the Project. As the Mine Development Envelope does not contain an ‘important’ population of Quokka, the proposed clearance associate with the Project is unlikely to disrupt the breeding cycle of an important population. Criteria: Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline Response: Unlikely Reasoning: The species, while it may be present in the surrounding State Forest, has not been recorded within the Mine Development Envelope ((Biologic, 2011, 2018b). It was also not recorded in the Talison tenement area in 2011 (Biologic, 2011). There is no evidence that the Mine Development Envelope supports individuals or a population of Quokkas. The Mine Development Envelope contains habitat that may potentially be suitable for the Quokka, but none of this constitutes critical or preferred habitat. Most of the characteristics of preferred habitat are absent from Mine Development Envelope vegetation, specifically a complex fire-age mosaic that includes both recently and long unburnt vegetation, a dense understorey ideally of riparian or similar vegetation that will provide refuge from predators and heat, and an intensive fox baiting program. In their report of the 2018 survey, Biologic (2018) conclude that it is unlikely that the species will reside permanently within the Mine Development

Species	Impact
	Envelope, although may occasionally occur while dispersing through the landscape. Considering this and the above, it is unlikely that the Project will modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline. Criteria: Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat Response: Unlikely Reasoning: The project may potentially exacerbate existing invasive species (such as weeds and introduced predators) that already occur within the Mine Development Envelope and surrounding areas if not appropriately managed. Predation by, and competition from, foxes and feral cats is a known threat to Quokka. Feral pigs are also known to have an indirect effect on Quokka abundance through modification of habitat quality (DEC, 2013). The extent of these threats is expected to be similar within the Mine Development Envelope as in the surrounding State Forest, especially considering the similar availability of water. Talison implements annual fox and rabbit baiting and feral cat trapping as required. Other controls currently implemented by Talison that will minimise the likelihood of the establishment of new invasive species or the expansion of existing invasive species infestations/presence are: -Weed Control Management; -Dieback Management; and -Vehicle Hygiene Procedures These management controls will continue to be implemented as required throughout the expansion and operation of the mine (see Section 4 for more detail). Neither the Quokka's preferred nor critical habitat is present within the Mine Development Envelope. Potential suitable habitat is present throughout the Mine Development Envelope although very little of this exhibits characteristics known to be preferred by the species. The Project is an expansion of existing open cut mining and processing activities that have been occurring for over three decades. With appropriate controls, as described above and developed as required, the Project is unlikely to result in new invasive species becoming established, or

Species	Impact
	existing species spreading within the Mine Development Envelope or surrounds to the extent that Quokka are substantially impacted. Criteria: Introduce disease that may cause the species to decline Response: Unlikely Reasoning: While Quokkas have not been recorded from within the Mine Development Envelope or wider Talison tenement area, the Project area is within the known distribution range of the species and it is possible that Quokkas may occasionally occur while dispersing through the landscape (Biologic, 2018b). Disease has not been demonstrated as an important factor in the decline of the Quokka, however, it has been implicated as responsible for deaths of individuals. Potential disease threats include salmonella infection and toxoplasmosis (DEC, 2013). As a fauna species dependent upon a complex forest structure the Quokka is potentially threatened by Phytophthora Dieback. The loss of such forest structure has the potential to increase the risk of predation of, and result in the loss of food resources for Quokka (DEC, 2013). Phytophthora Dieback is known to be present within the Mine Development Envelope and the surrounding State Forest. The great majority of vegetation within the Mine Development Envelope is susceptible to the pathogen. Dieback management controls will be implemented throughout the expansion and operation of the mine. Prior to any ground disturbance activities, mapping of the Dieback status of vegetation will be carried out. Management protocols specific to the location and extent of infested and uninfested areas within the Mine Development Envelope will be established to prevent the spread of the pathogen, and prevent its introduction to previously uninfested areas. Existing management controls for known infested areas will continue to be implemented. Refer to Section 4 for more detail on Dieback management controls. As the Project comprises the expansion of an existing facility that has been in place and in operation for more than 30 years, it is not likely that a disease would be introduced that could cause Quokka to decline.

Species	Impact
	The Quokka is unlikely to be exposed to any additional diseases (that do not currently occur in that environment) as a result of the Project. Criteria: Interfere substantially with the recovery of the species Response: Unlikely Reasoning: The clearing that will be required to facilitate the Project is unlikely to interfere substantially with the recovery of the Quokka as it does not compromise any of the actions specified in the species' Recovery Plan. Actions listed in the Plan are: • Coordinate recovery actions • Undertake survey and regular monitoring • Undertake research and monitoring to improve understanding of threats and effectiveness of mitigation programs • Protect and manage key populations and habitats • Undertake translocations and captive breeding as required • Undertake education and communication activities Of these, the most relevant to the proposed clearing that will result from the Project is 'Protect and manage key populations and habitats'. However, this action does not relate to the Project as the Mine Development Envelope does not contain either a key Quokka population or key habitat for the species. As such, it is very unlikely that the Project will interfere substantially with the recovery of the species. Outcome – The project is unlikely to have a significant impact on Quokka.
Caladenia harringtoniae - Vulnerable	Caladenia harringtoniae (Pink Spider Orchid) is known from a total of 37 populations distributed between Nannup and Albany in the south-west of Western Australia. C. harringtoniae is a tuberous perennial herb. It is visible above ground between August-November/December. The distinctive pink flowers are present from October to November (Brown et al., 2006). Not all plants in a population will flower annually, with flowering influenced by environmental conditions including the presence or absence of summer fire and the amount of rainfall received during winter and spring. As such, it is possible that the species may be present in an area but not be found during single-year field surveys. The species occurs in a number of habitats but is most common in wet sites where soils are saturated for several months of the year. Melaleuca-Flooded gum swamps and flats, and

Species	Impact
	creeklines in Jarrah and Karri forest types are all represented. It appears to be relatively well conserved but is in need of ongoing monitoring in relation to habitat change (Hearn et al.,2006). Plants are killed by fire during their active growing period (May-November). However, flowering is known to be stimulated by summer fire (December-April), with most populations having only been seen in any numbers in the spring following a summer fire. As the species is linked to wet sites, significant changes to water tables over time may impact on the long-term viability of populations. C. harringtoniae is restricted to a single location (26 individual plants) in State Forest in the south west of the Talison tenement area. This known population and the associated winter-wet dampland habitat in which it occurs is a designated Environmentally Sensitive Area (Onshore Environmental, 2012). The species was not found in the Mine Development Envelope. The nearest records, from the above-mentioned population, are located approximately 500 m west of the Mine Development Envelope boundary in tenement M01/3. The population that was recorded comprised 26 plants associated with an unincised drainage line /dampland. Despite extensive ground truthing of the Talison tenement area, including within the Mine Development Envelope, and targeted searches of similar habitat, no additional populations were recorded (Onshore Environmental 2012). Significant Impact Guidelines An assessment of impacts on Caladenia harringtoniae was undertaken against the Significant Impact Guidelines 1.1 (DotE 2013) as presented below. The assessment includes criteria for Vulnerable species. Criteria: Lead to a long-term decrease in the size of an important population of a species Response: Unlikely Reasoning: Despite targeted searches of vegetation meeting the description of the species' known habitat within the Mine Development Envelope, the species was not found. Like all Caladenias, C. harringtoniae is not visible all year round and plants within a population would not necessarily flower every year. As such, it is possible that it

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	may occur within the Mine Development Envelope despite not being found during the targeted field survey. The species' flowering is known to be stimulated by summer fire (December-April), with most populations having only been seen in any numbers in the spring following a summer fire. In spite of this, the forest in which the species was located had not been burned for about 6 years (Onshore Environmental, 2012). However based on the available data and the significant survey effort expended to find the species outside of the known population, it is unlikely that it is present within the Mine Development Envelope. It is very unlikely that an 'important population' as defined in the Significant Impact Guidelines 1.1 (DotE 2013) is present within the Mine Development Envelope. The clearing required for the Project is unlikely to lead to a long-term decrease in the size of an important population of a species. Criteria: Reduce the area of occupancy of an important population Response: Unlikely Reasoning: C. harringtoniae is found in seasonally-wet flats, around the margins of freshwater lakes and along the edges of seasonal creeklines. All such habitat within the Mine Development Envelope, of which there is little, was searched during the 2012 targeted survey, but the species was not found. Previous surveys carried out within or near to the Mine Development Envelope between 1991 and 2010 by various consultants also failed to locate the species (Onshore Environmental, 2011). Considering that searches have been carried out over multiple years, it is likely that if the species was present, it would have been located. While suitable habitat is present within the Mine Development Envelope, and it is possible that the species may not have been visible at the time of survey, it is unlikely that it is present within the Mine Development Envelope. It is very unlikely that an important population of C. harringtoniae is present within the Mine Development Envelope. The clearing required for the Project is unlikely to lead to a long-term decrease in the size of an important population of a species. Criteria: Fragment an

Species	Impact
	existing important population into two or more populations Response: Unlikely Reasoning: No populations of C. harringtoniae were found within the Mine Development Envelope during the 2011 targeted survey or in previous surveys carried out within or around the Mine Development Envelope. The only record of the species within the vicinity of the Mine Development Envelope is the known population 500 m to the west, associated with a seasonally-wet dampland. While the Mine Development Envelope contains areas of suitable habitat for the species, it is unlikely that it is present. Considering that searches have been carried out over multiple years, it is likely that if the species was present, it would have been located. It is very unlikely that an important population of C. harringtoniae is present within the Mine Development Envelope. As such, the clearing required for the Project is unlikely to fragment an important population of a species. Criteria: Adversely affect habitat critical to the survival of a species Response: Unlikely Reasoning: Critical habitat for the species has not been identified and a Recovery Plan has not been prepared for the species. Based on records of known populations, C. harringtoniae is found in vegetation associated with seasonally-wet flats, around the margins of freshwater lakes and along the edges of seasonal creeklines. Some suitable habitat for C. harringtoniae is present within the Mine Development Envelope, and will be lost as a result of the clearing required for the Project. However, despite targeted searches and surveys over multiple years, no populations of the species have been found within or near to the Mine Development Envelope, aside from the existing known population that is listed in DBCA databases. Additionally, there are no historical records of its presence outside of the single known population. As such it is unlikely that the species occurs in areas of suitable habitat within the Mine Development Envelope. Suitable habitat within the Mine Development Envelope is therefore considered unlikely to be habitat critical to the survival of the species. The Project is unlikely to adversely affect

Species	Impact
	habitat critical to the survival of a species. Criteria: Disrupt the breeding cycle of an important population Response: Unlikely Reasoning: It is not known whether the proposed clearing that will result from the Project will disrupt the breeding cycle of C. harringtoniae, because factors affecting the species' breeding cycle are not known. However, based on available data, it is considered unlikely that C. harringtoniae is present within the Mine Development Envelope and very unlikely that an 'important population' is present. While some areas of habitat potentially suitable for the species will be lost due to clearing, it is unlikely that the clearing will disrupt the breeding cycle of an important population. Criteria: Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline Response: Reasoning: There are 37 known populations of C. harringtoniae, located between Nannup and Albany. 22 of the 24 populations known from the Warren Natural Resource Management (NRM) Region (in which the Mine Development Envelope is located) are located within State Forest and one is in a Nature Reserve. The remainder occur in road reserves or in Unallocated Crown Land. C. harringtoniae appears to be relatively well conserved (Hearn et al.,2006). Considering that there are numerous known populations of the species, most in Government-managed land, and that these are distributed over a very large area, it is unlikely that the loss of areas of suitable habitat in the Mine Development Envelope will have any impact on the species' viability or persistence, particularly as the species is not known to occur within these areas of suitable habitat. The clearing required for the Project is unlikely to lead to a significant modification, destruction, removal, isolation or decrease the availability or quality of habitat to the extent that the species is likely to decline. Criteria: Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat Response: Unlikely Reasoning: The project may potentially exacerbate existing invasive

Species	Impact
	weed species that already occur within the Mine Development Envelope and surrounding areas. Due to the long history of disturbance in the Greenbushes area from mining, forestry and agriculture, numerous weed species are present within the Mine Development Envelope and surrounding State Forest (Onshore Environmental, 2012). Talison has a documented Weed Control Management Plan under which annual monitoring of weeds is carried out. Data collected during monitoring informs Talison's targeted weed control program requirements. Other controls currently implemented by Talison that will minimise the likelihood of the establishment of new invasive species or the expansion of existing invasive species infestations/presence are: -Dieback Management; and -Vehicle Hygiene Procedures These management controls will continue to be implemented as required throughout the expansion and operation of the mine (see Section 4 for more detail). Some areas of suitable habitat for C. harringtoniae are present in the Mine Development Envelope, although despite significant survey effort, the species has not been recorded from the Mine Development Envelope. The Project is an expansion of existing activities that have been occurring for over three decades. The existing known population of C. harringtoniae has persisted during this time. With the continued implementation of appropriate controls, as described above and developed as required, the Project is unlikely to result in new invasive species becoming established, or existing species spreading within the Mine Development Envelope or surrounds to the extent that C. harringtoniae is substantially impacted. Criteria: Introduce disease that may cause the species to decline Response: Unlikely Reasoning: While C. harringtoniae has not been recorded from within the Mine Development Envelope it is recorded from within the Talison tenement area. Suitable habitat for the species is present within the Mine Development Envelope and as such it is possible that the species occurs there, but this is considered unlikely. Substantial survey effort has been expended over multiple years to

Species	Impact
	locate the species outside of the known population, without success. Aside from the potential impacts of Phytophthora Dieback, disease is not known to be an important factor for C. harringtoniae. Phytophthora Dieback is known to be present within the Mine Development Envelope and the surrounding State Forest. The great majority of vegetation within the Mine Development Envelope is susceptible to the pathogen. Dieback management controls are currently, and will continue to be, implemented throughout the expansion and operation of the mine. Prior to any ground disturbance activities, mapping of the Dieback status of vegetation will be carried out. Management protocols specific to the location and extent of infested and uninfested areas within the Mine Development Envelope will be established to prevent the spread of the pathogen, and prevent its introduction to previously uninfested areas. Existing management controls for known infested areas will continue to be implemented. Refer to Section 4 for more detail on Dieback management controls. As Phytophthora Dieback management controls are currently, and will continue to be, implemented throughout the expansion and operation of the mine. It is unlikely that the pathogen's impact on C. harringtoniae will change as a result of the Project. Other diseases are not known to be an issue for the species, therefore the Project is unlikely to introduce additional disease(s) that may cause the species to decline. Criteria: Interfere substantially with the recovery of the species Response: Unlikely Reasoning: A Recovery Plan has not been prepared for the species. Some areas of suitable habitat for C. harringtoniae are present within the Mine Development Envelope and will be lost as a result of the clearing required for the Project. However, despite targeted searches and surveys over multiple years, no populations of the species have been found within or near to the Mine Development Envelope, aside from the single existing known population. Nor are there historical records of its presence outside of this population. As such it is unlikely that the

Species	Impact
	species occurs in areas of suitable habitat within the Mine Development Envelope. The proposed clearing will lead to the loss of some areas of suitable C. harringtoniae habitat but as the species is not known to be present within this habitat it is unlikely that the clearing will impact on the species. It is therefore unlikely that the Project will interfere substantially with the recovery of the species. Outcome – The project is unlikely to have a significant impact on C. harringtoniae.

2.4.2 Do you consider this impact to be significant?

Yes

2.5 Is the proposed action likely to have ANY direct or indirect impact on the members of any listed migratory species, or their habitat?

No

2.6 Is the proposed action to be undertaken in a marine environment (outside Commonwealth marine areas)?

No

2.7 Is the proposed action to be taken on or near Commonwealth land?

No

2.8 Is the proposed action taking place in the Great Barrier Reef Marine Park?

No

2.9 Is the proposed action likely to have ANY direct or indirect impact on a water resource related to coal/gas/mining?

No

2.10 Is the proposed action a nuclear action?

No

2.11 Is the proposed action to be taken by the Commonwealth agency?

No

2.12 Is the proposed action to be undertaken in a Commonwealth Heritage Place Overseas?

No

2.13 Is the proposed action likely to have ANY direct or indirect impact on any part of the environment in the Commonwealth marine area?

No

Section 3 - Description of the project area

Provide a description of the project area and the affected area, including information about the following features (where relevant to the project area and/or affected area, and to the extent not otherwise addressed in Section 2).

3.1 Describe the flora and fauna relevant to the project area.

Flora

A Level 2 flora and vegetation study (now referred to as a detailed flora and vegetation survey) was undertaken in Spring 2011 across all of the Talison Greenbushes mining leases covering 10,059.82 ha (Onshore Environmental 2012). This vegetation study was the first broad scale assessment of all the Greenbushes mining leases and has been referred to by Talison as a baseline for environmental approvals, impact assessment and closure planning. The study included a review of previous survey work completed within and immediately adjacent to the Study area, along with a comprehensive detailed flora and vegetation survey including description and mapping of vegetation communities and condition, targeted searches for significant flora, and identification of introduced (weed) species present within the area (Onshore Environmental 2012). A review of the survey was undertaken in February 2018 (Onshore Environmental 2018a) to assess its adherence to the most recent technical guidelines for flora and vegetation surveys (EPA 2016) and address any updates required in relation to nomenclature, conservation significance and GIS mapping. The review identified that the proposed areas of disturbance for the Project were not surveyed as intensively as other areas during the 2011 survey. As a result, Onshore Environmental were engaged to undertake a single season detailed flora and vegetation survey of the Mine Development Envelope between 27 February 2018 to 2 March 2018 (Onshore Environmental 2018b).

The 2011 survey recorded 368 plant taxa from 73 families and 208 genera within the Talison Greenbushes mining leases. Species representation was greatest among the Fabaceae, Poaceae, Myrtaceae, Malvaceae, Asteraceae, Orchidaceae, Cyperaceae, Proteaceae and Stylidiaceae families. The most speciose genus was Acacia (18 taxa), followed by Stylidium (10 taxa), Caladenia (7 taxa), Lepidosperma (6 taxa), Lomandra (6 taxa) and Hakea (6 taxa) (Onshore Environmental 2012).

The 2018 survey recorded 231 plant taxa (including varieties and subspecies) from 56 families and 138 genera within the Mine Development Envelope. Species representation was greatest among the Fabaceae, Cyperaceae, Proteaceae, Myrtaceae and Poaceae families. The most speciose genus was Acacia (18 taxa), followed by Leucopogon, Hibbertia and Lomandra (6 taxa each) (Onshore Environmental 2018b).

The 2011 and 2018 surveys did not locate any Threatened Flora listed under the EPBC Act within the proposed Mine Development Envelope for the Project however a population of the listed species (Caladenia harringtoniae), was recorded approximately 500 m west (Onshore Environmental 2012, 2018a, 2018b). Searches of the EPBC Act Protected Matters database identified the potential presence of two additional Threatened Flora species in proximity to the

Mine Development Envelope, Caladenia hoffmanii and Diuris micrantha. Neither of these species were identified during the 2011 or 2018 survey (Onshore Environmental 2012, 2018b) despite searching of specific areas of interest including granite outcrops, deep grey sandy soils on lower slopes and unincised drainage lines supporting Xanthorrhoea preissii.

A total of 86 introduced flora species were recorded within the Talison Greenbushes mining leases. during the Onshore Environmental 2011 survey. Three of those recorded are Declared Plants under the Biosecurity and Agricultural Management Act 2007 (BAM Act) (Onshore Environmental 2012);

-Asparagus asparagoides (Bridal Creeper),

- Galium aparine (Goosegrass), and

- Rubus ulmifolius (Blackberry).

A total of 32 introduced flora species were recorded within the Mine Development Envelope during the Onshore Environmental 2018 survey, of which three taxa are Declared Plants under the BAM Act:

- Asparagus asparagoides (Bridal Creeper),

- Rubus anglocandicans (Blackberry), and

- Rumex acetosella (Sorrell).

The relatively high diversity of weeds within the Talison Mine Development Envelope reflects the long mining history of the Greenbushes area and close proximity to surrounding agricultural land (Onshore Environmental 2018b). Many of the weed species recorded are likely to have been introduced during early exploration and mining, becoming established on disturbed ground and volunteering into adjacent areas. High moisture habitats are particularly vulnerable to colonisation by weeds, however infestations recorded in 2018 were generally localised (Onshore Environmental 2018b). Farmland in the southern sector of the Mine Development Envelope is another source of introduced species, with ‘edge effects’ typically evident around the boundary of cleared annual pasture areas. The annual pasture and verge species are represented within intact native vegetation as a minor component of the understorey. Disturbed areas such as tracks and historical rehabilitation are more susceptible to invasion by these taxa, which are generally not vigorous and do not impact on native vegetation structure (Onshore Environmental 2018b).

Fauna

A Level 1 vertebrate fauna survey (EPA, 2004b) was undertaken in Spring 2011 across all of the Talison Greenbushes mining leases covering 10,059.82 ha (Biologic 2011). The purpose of the survey was to map and describe fauna habitats and species occurring within the Talison Greenbushes mining tenure. In support of the survey, a comprehensive literature and database review of previous fauna surveys and records within the Study area was undertaken. The survey included nocturnal surveys, bat recording, motion camera recording and opportunistic surveys of tracks, scats, other traces of fauna, and incidental recordings. A targeted survey for

conservation significant fauna within the area including habitat assessments for Black Cockatoo species (Biologic 2011) was also undertaken.

A desktop assessment by Biologic (2011) identified 196 vertebrate fauna species with the potential to occur within the Talison Greenbushes mining leases. Eighty-two (82) of these species were recorded within the area during the field assessment. The fauna assemblage recorded comprised eight native mammal species, six introduced mammal species, 59 bird species, four reptile species and five amphibian species. The number of reptile species was low due to the cool conditions during the time of the survey. Four species of conservation significance were recorded from the study area: Wambenger Brush-tailed Phascogale, Forest Red-tailed Black Cockatoo, Baudin's Black Cockatoo, and Carnaby's Black Cockatoo. The Rainbow Bee-eater (Marine species under the EPBC Act) was also recorded (call) within the Mine Development Envelope during the 2011 survey (Biologic 2011) but has not been recorded during recent surveys.

A more recent desktop assessment undertaken by Biologic (2018a) identified a total 285 species of vertebrate fauna, which have previously been recorded and/or have the potential to occur within the Talison Greenbushes mining leases. This comprises 31 native mammals, 10 non-native mammals, 169 birds (six of which are introduced), 45 reptiles, 19 amphibians and 11 fish species. Of the 285 species, 44 species are of conservation significance, of which eight have been recorded within the Mine Development Envelope (Biologic 2018a). A targeted fauna survey of the Mine Development Envelope was undertaken by Biologic in February 2018 (Biologic 2018b). This survey identified a total of 43 species comprising 14 mammals (including six introduced species), 30 birds, seven reptiles and two amphibians. Six species of conservation significance were recorded during the survey (Attachment 1 – Figure 7). The conservation significant fauna species which have been recorded from the Mine Development Envelope are listed below (Biologic 2018a):

- Western Ringtail Possum - Vulnerable (EPBC Act), Critically Endangered (WC Act)

- Western Quoll/Chuditch – Vulnerable (EPBC Act and WC Act)

- Carnaby's Cockatoo (Calyptorhynchus latirostris) – Endangered (EPBC Act, WC Act);

- Baudin's Cockatoo (Calyptorhynchus baudinii) – Endangered (EPBC Act, WC Act);

- Forest Red-tailed Black Cockatoo – Vulnerable (EPBC Act and WC Act)

- Wambenger Brush-tailed Phascogale – Vulnerable (WC Act)

- Southern Brown Bandicoot – Priority 4 (DBCA Priority List)

- Western Brush Wallaby – Priority 4 (DBCA Priority List)

The Western Ringtail Possum was identified from scats possibly belonging to the species however due to the similarity with scats of the Common Brushtail Possum within this region their identification cannot be confirmed (Biologic 2018b).

Based on distribution, previous records and the habitats present, of the 44 species of

conservation significance potentially occurring in the Mine Development Envelope, two were deemed highly likely, two likely, six possible, one rarely, seven unlikely and eighteen highly unlikely to occur (Biologic 2018a)

The 2011 survey identified four major natural fauna habitat types within the Talison mining tenure: Jarrah/Marri forest, Jarrah/Marri forest over Banksia dominated understorey, Marri/Blackbutt/Flooded Gum Woodland over Banksia dominated midstorey, and Leptospermum scrub (Biologic 2011). The 2018 survey confirmed all but the Leptospermum scrub occur within the Mine Development Envelope (Biologic 2018b) (Attachment 1 – Figure 7). Jarrah/Marri forests are the most dominant vegetation type with the Mine Development Envelope and surrounding Talison mining tenure. Anthropogenic fauna habitats which were also identified through the surveys are dominated by cleared farmlands, plantations, mine disturbance, water bodies and rehabilitation.

The fauna habitats and sightings of conservation significant fauna within the Mine Development Envelope are illustrated in Attachment 1 – Figure 7.

Introduced fauna of significance (due to predation and habitat degradation impacts) which have been identified within the Talison Greenbushes mining tenements include (Biologic 2011, 2018a, 2018b):

- Dog (Canis lupus)
- Cat (Felis catus)
- European Cattle (Bos taurus)
- Horse (Equus caballus)
- Rabbit (Oryctolagus cuniculus); and
- Fox (Vulpes vulpes)

3.2 Describe the hydrology relevant to the project area (including water flows).

Wetlands

No Ramsar listed or Nationally Important wetlands occur within 5 km of the Mine Development Envelope. The closest Ramsar/ Nationally Important wetland is the Vasse-Wonnerup Wetland System, approximately 60 kilometres to the south-west of the Mine. Similarly, there are no conservation category or resource enhancement wetlands within 5 km of the Project. A man-made wetland is present at Vultans within the Mine Development Envelope which is a historic tailings area and mining void currently used for water storage from the pit and TSF 1 seepage and return to the processing circuit. Another swamp/wetland area is present adjacent to Austins Dam. Groundwater flows from the east (are of the mining pits) discharge to this wetland.

Surface Water

The majority of the Mine Development Envelope is located within the Middle Blackwood Surface Water Area, within the Norilup Brook sub-area, the upper reaches of the Hester Brook sub-area and the upper reaches of the Woljenup Creek sub-area (Attachment 1 – Figure 10). The water courses are all tributaries of the Blackwood River. The Blackwood River Catchment is the largest in the South West of WA. These areas are not proclaimed under the Rights in Water and Irrigation Act 1914 (RIWI Act).

The Greenbushes Mine open pits are located along a ridgeline (topographic divide) which runs from the Greenbushes Township (~310 m AHD) towards the southeast (~270 m AHD). Surface and groundwater flows are directed to the east and west from the divide. The Floyds WRL is located on the east facing hill slope and surface flows from this area drain into the Saltwater Gully, a tributary of the Hester Brook. The administration, lithium processing plant area, TSFs and constructed reservoirs and dams associated with the operation are located on the west facing hill slope which descends to 245 m AHD. This area drains into the Norilup Brook via Spring Gully and Cowan Brook. Hester Brook and Norilup Brook are both tributaries of the Blackwood River (Talison 2015).

Surface water flows are collected in constructed reservoirs/dams and TSFs within the Mine Development Envelope for use in the Mine Water Circuit. The Mine Water Circuit water storage infrastructure has a total capacity of approximately 5,800 ML (excluding open pits). Additional water storage dam are proposed for construction as part of the Project which will increase the total capacity of water storage for the Project.

Talison has undertaken surface water quality monitoring since 1997. The results indicate that surface water quality is generally good with elevated levels of Li, As and Iron (Fe) attributable to the natural mineralogy and history of mining activity. Seasonal variation in water quality also occurs as a result of evaporation in summer and additional rainfall in winter. Current surface water monitoring locations are illustrated in Attachment 1 - Figure 10.

Talison is currently undertaking a Surface Water Assessment to support the Mining Proposal application for the Project. The study will characterise the existing surface water environment and potential changes associated with the implementation of the Project.

Groundwater

The Mine Development Envelope for the expanded mining operation is located in the Karri subarea of the Karri Groundwater Area (Talison 2015). The Karri area is not a proclaimed groundwater area. The groundwater flow system in the area is classified as ‘local flow systems in Precambrian rocks’ (BoM 2017).

The Archaean host rocks of the region which underlie the site are generally considered as relatively low yielding groundwater sources. Localised faults and fractures can provide increased yields and isolated aquifers but there is no evidence of large-scale water movement in fractured rocks at Greenbushes. The aquifers are confined and tend to be brackish to saline. The dominant basement groundwater flows usually occur within the weathered host rock

material, which can develop lateritic weathering profiles 20 to 50 m thick. These are comprised of leached clays and lateritic caprock near the current ground surface, and grade into oxidised and fresh bedrock at depth.

Regular groundwater monitoring has been undertaken since 1997 and water levels have remained relatively stable since. The results show seasonal fluctuations whereby water levels reach a maximum at the end of winter in October, then decline to the lowest point at the end of summer in April. The recorded groundwater levels indicate that groundwater flows are directed to the east and west from the previously described ridgeline (drainage divide). Flow from the area of the processing plant and TSFs discharges to a swamp/wetland area on the east side of Austin's Dam and a drain running from the TSF to Austin's Dam (SES 2017) indicating the presence of a perched aquifer. Swampy areas between Maranup Ford Road and Austins Dam indicate the area is also potentially a groundwater discharge area.

Groundwater from eastern margin of the TSF, open pits and Floyds WRL flows in an easterly direction. A spring originates at the toe of Floyds WRL which discharges groundwater to Hester Brook via Floyds Gully and Salt Water Gully.

The Greenbushes mine is developed in a mineralised area and consequently concentrations of various metals in groundwater are likely to be higher than levels in the surrounding environment outside the mineralised zone. Groundwater monitoring has been undertaken within the Mine Development Envelope since 1997. Metal concentrations exceed the Australian Drinking Water Guidelines (ADWG) and/or ANZECC Guidelines for Irrigation in some bores for Mn, Fe, Li, P, As, Ni, Co, and. Cd. Results have however remained relatively stable over time with the exception of As, and Li in some bores.

Current ground water monitoring locations are illustrated in Attachment 1 - Figure 10.

Talison are currently undertaking a Hydrogeological Study to support the Mining Proposal application for the Project. The study is investigating the hydrogeology of the main expansion areas associated with the Project (Floyd's WRL and TSF 4) to develop and expand the hydrogeological understanding of the site beyond the current extent of development.

3.3 Describe the soil and vegetation characteristics relevant to the project area.

Soils

The Mine Development Envelope is located within the Darling Plateau, which consists of an undulating dissected peneplain with gravelly, pale orange soils. Deep steeply-sided valleys occur throughout the area, occasionally punctuated by dome-shaped granite outcrops (Water Corporation, 2004). Soils are predominantly gravels with occasional block laterite outcrops and some elevated areas of sands and sandy loams. In the deeper valleys, the soils are heavier alluvials (Water Corporation, 2004).

The Mine Development Envelope intersects seven soil landscape mapping units identified from the soil landscape mapping of the south west of Western Australia (DAFWA 2007) (Attachment 1 – Figure 11). These are listed below. The largest areas comprise the Dwellingup subsystem and the Darling Plateau disturbed land, mine Phase.

- *255DpDW (Dwellingup subsystem)* - Divides, lower to upper slopes and hillcrests. Duplex sandy gravels and loamy gravels with minor areas of shallow gravels, deep sandy gravels, yellow deep sands and yellow and pale deep sands, often gravelly.

- *255DpYGd (Yarragil Subsystem, downstream valleys phase)* - Shallow, narrow valleys. Relief 20-40 m slopes 3-10%. Valley floor is narrower than upstream phase. Soil parent materials are laterite, granite and gneiss. Soils are loamy gravels, loamy earths and deep sandy gravels.

- *255DpYGu (Yarragil Subsystem, upstream valleys phase)* - Relief 5-20 m slopes 3-10%. Valley floor is broader than downstream phase. Soil parent material is mainly laterite. Soils are gravels and sands.

- *255DpHR (Hester subsystem)* - Ridges and hill crests on laterite and gneiss, relief 5-40 m, slopes 5-15%. Soils are sandy gravels, loamy gravels and loamy earths.

- *255DpMH (Mornington Hill subsystem)* - Low hills on laterite overlying granite, relief 40-80 m, slope 5-20%. Soils are sandy and loamy gravels with some deep sands and loamy earths.

- *LvGR (Grimwade subsystem)* - Moderately deep valleys (30-70 m) in granite. Soils are loamy earths and loamy gravels.

- *DpXMINE (Darling Plateau disturbed land, mine Phase)* - Mine. Disturbed land.

Soils within the Mine Development Envelope have been impacted by historical alluvial tin mining practices undertaken since mining commenced in the area in the late 19th Century. The soil types present within the Mine Development Envelope include (IT Environmental 1999):

- Greenbushes alluvium formation

- Colluvium deposit

- Laterite – weathered zone

- Laterite – iron rich zone

- Laterite – pallid clay, saprolitic zone.

In some areas the surface topsoil has been degraded as a result of weed infestation and dieback. These soils have limited value as a resource for rehabilitation or other purposes. Talison undertake dieback surveys prior to commencing work within new areas to assess for the risk of dieback so appropriate management controls can be implemented prior to disturbance. An assessment of the soils and characteristics within the Mine Development Envelope has been commissioned by Talison to gain an understanding of the potential value, and quantity of soils which will be disturbed as a result of the Project and therefore available for rehabilitation.

Potentially Acid Forming Material

A range of waste rock and tailings characterisation studies have been undertaken throughout the operation of the Greenbushes mine to understand the potential for generation of Acid and Metalliferous Drainage (AMD) from the mining operation and develop suitable management processes to prevent AMD from occurring. Further characterisation work is being undertaken to support the Mining Proposal application for the Project.

The findings of the various studies undertaken indicate that:

The ore and waste from the Greenbushes deposit is not known to be dispersive.

- Waste rock mineralogy consists primarily of hard rock amphibolite, granofels and lesser amounts of dolerite.

- Analysis of waste rock and soil samples undertaken by Campbell (2000) found that the concentrations of environmentally significant elements were either below or close to those recorded for unmineralised soils and rocks with the exception of arsenic (As), antinomy (Sb) and lithium (Li).

- Waste rock at Greenbushes has sporadic occurrence of sulphide minerals which occur as trace components with Sulphide-S values typically <0.2-0.3% (Campbell 2014).

- The volumes of High-S lithotypes is estimated to constitute less than 1% of the waste rock (Campbell 2014). Low volumes of potentially acid forming (PAF) materials may therefore be present in the open pit in association with the pegmatite ore body along some areas of the footwall contact zones, hanging wall and in inliers of waste rock.

- Waste rock also contains amphibolite with calcite veining, and calcite has an acid neutralising capacity therefore PAF materials are able to be neutralised within in waste rock landforms.

- Talison implement a Waste Rock Management Plan and Environmentally Hazardous Waste Rock Management Plan to identify and manage waste rock which is PAF to prevent acid metalliferous drainage from occurring.

- Tailings and the ore body has a low acid producing potential with low concentrations of sulphides, and a theoretical maximum acid producing potential of 0.12 kg (H2SO4) per tonne for tailings and 0.04 kg (H2SO4) per tonne for ore. Given the very low sulphur values (close to zero), the classification of the ore and tailings is considered reflective of “Non?Acid Forming” (NAF) (GHD 2016).

- Ore assay and elemental statistical analysis results indicate, a total of 10 metals (As, Al, Bi Co, Cs, Hf, Li, Nb, Pb, Rb, Sb, Sn, Ta, Th, Ti, U and W) are relatively enriched compared to the benchmark of average crustal abundance. Five of these metals also exceeded the available regulatory trigger values (As, Cs, Cr, Ni and Sn) (GHD 2016).

- Tailings assay, and elemental statistical analysis results indicate that of the 14 elements analysed a total of five metals were relatively enriched when compared to the average crustal abundance (As, Cs, Li, Rb, and W). Arsenic was also detected at concentrations that exceeded the regulatory trigger values (GHD 2016).

Vegetation Characteristics

The Greenbushes Lithium Mine is located in the Jarrah Forest biogeographical region as described by the Interim Biogeographic Regionalisation for Australia (IBRA) (Thackway & Cresswell 1995). The Jarrah Forest region is subdivided into two subregions, with the Project occurring within the Southern Jarrah Forest subregion (JF2) (Hearn et al 2002). The Southern Jarrah Forest sub-region is described as, “Duricrusted plateau of Yilgarn Craton characterised by Jarrah-Marri forest on laterite gravels and, in the eastern part, by Marri-Wandoo woodlands on clayey soils. Eluvial and alluvial deposits support Agonis shrublands. In areas of Mesozoic sediments, Jarrah forests occur in a mosaic with a variety of species-rich shrublands. The climate is Warm Mediterranean” (Hearn et al. 2002).

The vegetation of the sub-region is described as “Jarrah - Marri forest in the west grading to Marri and Wandoo woodlands in the east. There are extensive areas of swamp vegetation in the south-east, dominated by Paperbarks and Swamp Yate. The understory component of the forest and woodland reflects the more mesic nature of this area. The majority of the diversity in the communities occurs on the lower slopes or near granite soils where there are rapid changes in site conditions” (Hearn et al. 2002).

The Mine Development Envelope is mapped as Beard Vegetation Association 3 – Medium Forest; Jarrah-Marri. Vegetation complexes of the South West Forest Region have previously been mapped by Heddle et al (1980) and Mattiske and Havel (1998), and updated by Webb et al., 2016. Vegetation complexes mapped within the Mine Development Envelope include those listed below. The majority of the Mine Development occurs within the Dwellingup complex.

- *Dwellingup (D1)* - Open forest of Eucalyptus marginata subsp. marginata-Corymbia calophylla on lateritic uplands in mainly humid and subhumid zones.

- *Hester (HR)* - Tall open forest to open forest of Eucalyptus marginata subsp. marginata-Corymbia calophylla on lateritic uplands in perhumid and humid zones.

- *Goonaping Complex (G)* - Mosaic of open forest of Eucalyptus marginata subsp. marginata (humid zones) and Eucalyptus marginata subsp. thalassica (semiarid to perarid zones) on the sandy-gravels, low woodland of Banksia attenuata on the drier sandier sites (humid to perarid zones) with some Banksia menziesii (northern arid and perarid zones) and low open woodland of Melaleuca preissiana-Banksia littoralis on the moister sandy soils (humid to perarid zones).

- *Catterick (CC1)* - Open forest of Eucalyptus marginata subsp. marginata-Corymbia calophylla mixed with Eucalyptus patens on slopes, Eucalyptus rudis and Banksia littoralis on valley floors in the humid zone.

- *Grimwade (GR)* - Tall open forest to open forest of Corymbia calophylla-Eucalyptus marginata subsp. marginata with Eucalyptus patens on slopes and Eucalyptus rudis over some Agonis flexuosa on lower slopes in the humid zone.

Onshore Environmental (2012) mapped and described eight vegetation associations within the Talison Greenbushes mining leases. A review and update of the vegetation mapping within the

Mine Development Envelope was undertaken as part of the Onshore Environmental 2018 detailed flora and vegetation survey to account for disturbance which has occurred since the 2011 survey. A total of nine vegetation types from three broad landforms were described and mapped from the Mine Development Envelope (Attachment 1 – Figure 8). The vegetation types were classified into seven broad floristic formations according to dominant vegetation strata. :

- Eucalyptus Woodland

- Eucalyptus Forest

- Corymbia Forest

- Podocarpus Heath A

- Hypocalymma Low Heath C

- Melaleuca Forest; and

- Pteridium Dense Heath A

The vegetation types identified are described below:

- Eucalyptus Forest

- Hs Bo - Forest of Eucalyptus marginata subsp. marginata and Corymbia calophylla over Low Heath D of Bossiaea ornata and Leucopogon capitellatus on grey/brown loamy sand on hillslopes.

- DL Er - Forest of Eucalyptus rudis subsp. rudis (sometimes mixed species) over Scrub of Trymalium odoratissimum subsp. odoratissimum, Taxandria linearifolia and/or Hakea prostrata over Open Tall Sedges of Lepidosperma tetraquetrum or Chorizandra enodis on brown sandy clay loam on minor drainage lines

- Eucalyptus Woodland

- DL EpCc Tp - Woodland (to Forest) of Eucalyptus patens and Corymbia calophylla (sometimes with Banksia seminuda or Banksia littoralis) over Thicket of Taxandria parviceps (sometimes with Bossiaea linophylla, Acacia extensa and Pteridium esculentum) over Open Dwarf Scrub D of Dasypogon bromeliifolius and Conospermum capitatum on grey sand on drainage lines

- Corymbia Forest

- HS Bg - Forest of Corymbia calophylla and Eucalyptus marginata subsp. marginata over Low Woodland A of Banksia grandis, Persoonia longifolia, Corymbia calophylla and Eucalyptus marginata subsp. marginata over Open Low Scrub A of Pteridium esculentum and Macrozamia riedlei over Low Heath D of Bossiaea ornata and/or Leucopogon capitellatus on brown sandy loam on upper hillslopes

- HS Xp - Forest of Corymbia calophylla and Eucalyptus marginata subsp. marginata over Scrub of Xanthorrhoea preissii (Bossiaea linophylla) over Dwarf Scrub C of Xanthorrhoea gracilis and Phyllanthus calycinus on brown sandy loam on hillslopes

- Podocarpus Heath A

– HS Pd TpBl - Heath A of Podocarpus drouynianus (Pultenaea ocheata) with Woodland (to Forest) of Eucalyptus marginata subsp. marginata and Corymbia calophylla over Scrub of Taxandria parviceps (Bossiaea linophylla) over Dwarf Scrub C/D of Dasypogon bromeliifolius, Adenanthos obovatus and Leucopogon oxycedrus on grey sand on lower hillslopes

- Hypocalymma Low Heath C

– Low Heath C of Hypocalymma angustifolium, Babingtonia camphorosmae and Banksia dallanneyi (Xanthorrhoea gracilis and Bossiaea ornata) with Low Woodland A of Eucalyptus wandoo (Corymbia calophylla) over Open Low Scrub B of Xanthorrhoea preissii, Acacia celastrifolia and Corymbia calophylla on grey clay loam soil on lower hillslopes

- Melaleuca Forest

- DF MpEp AsTl - Forest of Melaleuca preissiana and Eucalyptus patens over Scrub of Astartea scoparia and Taxandria linearifolia over Low Scrub B of Aotus gracillima and Pteridium esculentum over Open Low Grass of *Anthoxanthum odoratum and *Vulpia sp. indet over Very Open Tall Sedges of Isolepis cyperoides and Juncus pallidus on black sandy clay loam on seasonally wet drainage flats

- Pteridium Dense Heath A

- Dense Heath B of Pteridium esculentum on grey sand on seasonally wet drainage flat.

3.4 Describe any outstanding natural features and/or any other important or unique values relevant to the project area.

There are no outstanding natural features or important or unique values relevant to the Mine Development Envelope. The area lies within the oldest gazetted mineral field in WA, consequently the area has been impacted by mining activity for more than 100 years.

3.5 Describe the status of native vegetation relevant to the project area.

The Study area is mapped as Beard Vegetation Association 3 – Medium Forest; Jarrah-Marri. The extent of the vegetation associations has been determined by the state-wide vegetation remaining extent calculations maintained by the DBCA (GoWA 2018a). The current extent of vegetation association 3 is greater than 50% of its pre-European extent at all levels (State, IBRA bioregion, IBRA subregion and LGA).

Vegetation complexes of the South West Forest Region have previously been mapped by mapped by Heddle et al (1980) and Mattiske and Havel (1998), and updated by Webb et al.,

2016. Vegetation complexes mapped within the Mine Development Envelope are listed in section 3.3. The current extent of all vegetation complexes occurring within the Mine Development Envelope is more than 50% of the calculated pre-European extent within South West WA. All but the Grimwade complex have more than 50% of their current extent within DBCA managed lands (GoWA 2018b).

3.6 Describe the gradient (or depth range if action is to be taken in a marine area) relevant to the project area.

The Greenbushes Mine open pits are located along a ridgeline (topographic divide) which runs from the Greenbushes Township (~310 m AHD) towards the southeast (~270 m AHD). The ridgeline falls away to the west and the east of the open pit to approximately 240 m AHD at the western and eastern perimeter of the Mine Development Envelope

3.7 Describe the current condition of the environment relevant to the project area.

Vegetation condition within the Greenbushes region has been impacted by past activities including logging, access tracks, historical mine activities including excavation of costeans and shafts, construction of powerline and rail corridors, clearing for farmland and plantation timber, edge effects around the Greenbushes townsite and illegal dumping of domestic rubbish in addition to the more recent mining activity in the area (Onshore Environmental 2012).

Assessment of vegetation condition within the Mine Development Envelope (Onshore Environmental 2018b) was undertaken using a recognised rating scale based on the method detailed in Keighery 1994. The vegetation condition was primarily rated as Very Good (65%) or Good (28%). A summary of vegetation condition within the Mine Development Envelope is provided below. The summary excludes areas which have been cleared for mining or are part of the active mine site and are undergoing rehabilitation. It does however include historic mining areas that have been rehabilitated.

Very Good – 477.27 ha

Good – 207.74 ha

Degraded – 1.28 ha

Rehabilitation – 1.82 ha

Cleared – 44.90 ha (agricultural land)

The vegetation condition of the Mine Development Envelop is illustrated in Attachment 1 – Figure 9.

A habitat quality assessment (for Black Cockatoos) was undertaken by Ennovate (2018) for the 678 ha of remaining remnant vegetation within the Mine Development Envelope. The concept of “habitat quality” for Black Cockatoos differs from that of vegetation condition, as good quality nesting habitat for Black Cockatoos may include dead trees and areas where understorey

vegetation is absent or largely so (DSEWPAC, 2012a).

The assessment methodology for habitat quality uses a relative ranking approach, based largely on the capacity of the area's resources to meet the known habitat requirements of one or more of the three species of Black Cockatoo (cf Ennovate, 2016). The assessment was based on the results of the cockatoo survey undertaken by Kirkby (2018). Eleven blocks of remnant vegetation were assessed and assigned a habitat quality rating which ranged from 5 to 6 out of 10 (with the except of one area given a rating of 2 due to being within a predominantly cleared paddock).

3.8 Describe any Commonwealth Heritage Places or other places recognised as having heritage values relevant to the project area.

A database search was undertaken to determine whether the proposed mine expansion will impact on any World or Commonwealth Heritage Sites. No sites on the Commonwealth or World Heritage lists occur within 5 km of the Mine Development Envelope. One site (Southampton Farm Homestead) on the Register of National Estate is located approximately 6.5 km from the Mine Development Envelope.

A search on the inHerit Western Australia database did not identify any State registered sites within the Mine Development Envelope (Heritage Council 2017). The South Cornwall Pit, which is part of the operating mine, is listed as "Other Heritage Listings" on the Shire of Bridgetown-Greenbushes municipal inventory. It is a Category 2 site of local significance due to the continuous history of mining activity at this location. There are also numerous sites (predominantly buildings) within the town of Greenbushes that are listed on the Shire of Bridgetown-Greenbushes municipal inventory. The State registered sites closest to the mine, include:

- Golden Valley Site approximately 8 km north east; and

- Southampton Homestead approximately 6.5 km west.

Another site of historical significance which is not listed is the Greenbushes cemetery. The cemetery is located outside the Mine Development Envelope approximately 100 m east of the proposed expansion footprint for Floyds WRL. Talison contributes funding toward the upkeep and maintenance of this site. The location of heritage sites discussed is illustrated in Attachment 1 – Figure 12.

3.9 Describe any Indigenous heritage values relevant to the project area.

The Project occurs at the boundary of the South West Boojarah #2 Native Title Claim area (WC2006/004), and the Wagyl Kaip (WC1998/070) and Southern Noongar (WC1996/109) Native Title Claim areas. Talison has a Noongar Standard Heritage Agreement in place with the South West Boojarah #2 claimant group. A search of the Aboriginal Heritage Inquiry System identified one 'Registered' Site of Aboriginal heritage significance, the Blackwood River (ID 20434), and no Sites lodged as 'Other Heritage Places' in proximity to the Greenbushes Lithium Mine (DPLH 2017). The Blackwood River is a site of mythological significance in

association with Waugal beliefs (Brad Goode & Associates 2016). The Blackwood River site occurs within mining tenements M01/2, M01/4, M01/5, M01/10 and L01/1 and is outside the Mine Development Envelope for the Greenbushes Lithium Mine Expansion (Attachment 1 – Figure 12).

An Aboriginal Heritage Survey of the Greenbushes Lithium Mine was conducted by Brad Goode & Associates in December 2015/ January 2016 within the existing Mine Development Envelope within M01/3, G01/1, G01/2, M01/6, M01/16 and M01/7. The survey involved representatives of the Gnaala Karla Booja, South West Boojarah and Wagyl Kaip Native Title Groups (Brad Goode & Associates 2016). The survey included a desktop study, an archaeological inspection of the survey area, and ethnographic consultation with the nominated Noongar representatives. The survey did not identify any Aboriginal Sites of significance as defined under section 5 of the Aboriginal Heritage Act 1972 (AH Act). Some areas of the expanded Mine Development Envelope for the Project were not covered by the 2015/2016 survey therefore an ethnographic and archaeological survey of areas not previously surveyed was undertaken involving representatives of the South West Boojarah and Wagyl Kaip Native Title Groups in April 2018. The survey did not identify any Aboriginal heritage sites or places as defined by section 5 of the AH Act within the Mine Development Envelope.

3.10 Describe the tenure of the action area (e.g. freehold, leasehold) relevant to the project area.

The tenure of the land underlying the mining, general purpose and miscellaneous leases is predominantly State Forest with some Crown Land. Talison has been granted the following mining tenure over the Mine Development Envelope:

M01/3

M01/6

M01/7

M01/16

G01/1

G01/2

3.11 Describe any existing or any proposed uses relevant to the project area.

The majority of the Mine Development Envelope consists of the current active Greenbushes Lithium mine (1051 ha, 54.8%) which has been operated as an open cut hard rock mine for tantalum and spodumene ores since 1983. It also comprises areas of rehabilitation (127 ha, 6.6%) which were previously mined for the weathered regolith containing tantalum ores.

The mine is largely located within, and surrounded by the Greenbushes State Forest (SF20). As a consequence to mining within the Greenbushes State Fores, tenement conditions for mining tenure require Talison to pay compensation to the DBCA for the loss of timber resources within areas where the forest is lost as a result of mining activity. A further 12 State Forests are also known to occur within the surrounding 30 km, the nearest being Hester State Forest (immediately south of the Mine Development Envelope). There are also two Conservation Parks (Hester Conservation Park, 6 km east and Kerr Conservation Park, 12 km north), three National Parks (the nearest Dalgarup National Park, 7.7 km south-west), and four Nature Reserves (the nearest Greenbushes Nature Reserve 5.2 km west) within 30 km of the Mine Development Envelope (Biologic 2018a).

A second company, Global Advanced Metals Greenbushes Pty Ltd (GAMG), own the tantalum assets at the Greenbushes mine, and operate within some of the Talison tenure. The majority of the tantalum assets are currently in Care and Maintenance (mine and primary process plant) with the exception of some limited processing of tantalum concentrates through the secondary Tantalum Plant.

Section 4 - Measures to avoid or reduce impacts

Provide a description of measures that will be implemented to avoid, reduce, manage or offset any relevant impacts of the action. Include, if appropriate, any relevant reports or technical advice relating to the feasibility and effectiveness of the proposed measures.

Examples of relevant measures to avoid or reduce impacts may include the timing of works, avoidance of important habitat, specific design measures, or adoption of specific work practices.

4.1 Describe the measures you will undertake to avoid or reduce impact from your proposed action.

Avoidance measures

The Project is an expansion of an existing mining operation. Mineral resource developments are limited in the extent they can be moved from the location where the resource has been identified. Therefore, due to the nature of the Project being an expansion of an existing mineral resource development, the location of infrastructure and landforms is restricted by existing infrastructure and landforms, as well as the location of the ore body. Key constraints when planning the location of infrastructure and landforms include:

-South West Highway to the immediate east of the proposed Floyd's WRL footprint;

-Greenbushes townsite immediate north of the existing open pits;

- Water storage dams to the west of the mining and processing area; and

- The location of the ore body which could potentially be sterilised through placement of infrastructure and landforms.

The preliminary proposed expansion areas for the mine are illustrated in Attachment 1 – Figure 3. Based on the Proposed layout and expected disturbance areas required to establish landforms and infrastructure, it is anticipated that up to 385 ha of native vegetation clearing will be required which comprises habitat for the MNES described in Section 2.

The predicted clearing for the Project cannot be avoided as it is required to enable the mine expansion to occur. Talison has planned the location of infrastructure and landforms to occur within areas which have previously been subject to some degree of mining or agricultural disturbance where possible. For example, the TSF will be established in an area which includes an existing cleared paddock. Talison will only undertake clearing that is necessary for the mining operation, and it will be undertaken in a staged manner. Areas will be cleared as they are required to establish infrastructure and landforms. Timber resources are collected from proposed clearing areas by the Forest Products Commission prior to full clearing occurring. The Floyd's WRL footprint will be progressively expanded as new areas are required for waste rock storage. Existing areas of disturbance will be used for roads and infrastructure corridors

wherever possible. Development within the north west corner of the Mine Development Envelope, which is suitable habitat for MNES fauna species, and the Chuditch has been recorded within, is limited to minor infrastructure for explosive storage and handling, and access tracks to these facilities.

When planning the final footprint of infrastructure or landforms, Talison will consider the location of potential breeding trees with hollows which have been identified through the surveys undertaken. If modifications to the footprint of developments are able to be made to avoid any of these trees, these will be made. Talison recognises that this is not likely to be practical for large landforms such as the TSF 4 and Floyd's WRL, but may be able to be undertaken when planning the final footprint of internal roads, pipelines, the Mine Services Area and Explosives Infrastructure. Talison has a spatial record of all potential breeding trees with hollows that will be maintained, and considered as part of the design process of these developments.

Minimization measures

Potential impacts or threats to MNES present within the Mine Development Envelope and surrounds include:

-Possible loss of habitat in surrounding areas due to accidental clearing

-Possible introduction and/or spread of invasive pathogens causing habitat decline

- Possible introduction and/or spread of invasive plant species (weeds) causing habitat decline

- Changes to surface water drainage patterns and flows, or sedimentation causing habitat decline

- Habitat decline as a result of smothering by dust generated from the operational activities

- Damage to, and loss of habitat or mortality of fauna through accidental generation of a bushfire

- Death, injury or displacement of native fauna species due to vehicle interaction or entrapment associated with the mining operation

-Increased competition or predation by introduced species

- Disruption or disturbance to fauna as a result of noise, vibration, light and dust emissions from the mining operation.

Talison will protect MNES and their habitat from significant impact through the continued implementation of the Talison Greenbushes Lithium Mine Environmental Management System (EMS), which is certified to International Standard ISO 14001:2015. The EMS includes management plans and procedures relating to mining activities which may impact on MNES. Relevant management plans and procedures are included as attachments. A summary of proposed measures which will be implemented to minimise the risk of significant impact to

MNES are outlined below.

- Implementation of the Talison Greenbushes Operations Clearing/Disturbance Procedure and associated Permit process to prevent clearing outside approved boundaries, and ensure only necessary clearing is undertaken. The Procedure requires:

- Internal permits must be granted before clearing can occur

- All clearing areas must be demarcated prior to clearing.

- All clearing areas must be surveyed after clearing to confirm the area cleared.

- Implementation of the Talison Greenbushes Operations Weed Control Management Plan which outlines the weeds present, controls to prevent weed spread and introduction, and weed control programs which have been undertaken to date. Annual monitoring of weeds within rehabilitation areas is undertaken as part of rehabilitation monitoring. The outcomes inform targeted weed control program requirements.

- Talison employ a full time environmental officer to manage weeds on site. Regular weed monitoring and weed control programs are undertaken, and a contractor is employed to hand weed during spring and/or autumn. Weed management techniques include spraying with herbicides (undertaken in late winter or early spring), hand pulling and cutting. Seeding with native species at the earliest opportunity is a key undertaking to control weed infestation within disturbed areas, even if these areas may require disturbance again in the future.

- Implementation the overarching Talison Greenbushes Operations Dieback Management Plan. In addition, individual, area specific Dieback management plans are developed for new areas of disturbance to be implemented during the clearing of areas. The Management Plan requires strict adhere to hygiene procedures when moving from areas where dieback is known to occur to areas that are dieback free or not interpretable.

- Dieback surveys are undertaken prior to undertaking disturbance in areas not previously surveyed.

- Implementation of the Talison Greenbushes Operations Vehicle Hygiene Procedure intended to prevent the spread of weeds (and dieback). The Procedure requires:

- Vehicles to be cleaned prior to coming onto site from other areas. Vehicles are inspected to confirm this requirement is met.

- Vehicles to be cleaned if they have been operating within a weed or dieback infested area before they move to other work areas. Washdown facilities are provided on the minesite

- Implementation of the Talison Greenbushes Operations Native Flora and Fauna Protection Procedure which identifies conservation significant fauna and flora, and outlines general protection measures for these species and reporting requirements when conservation significant species are sighted or activies at the mine have resulted in injury or death of native fauna.

- The site induction includes information on MNES which may be encountered at the operation.

It includes descriptions of the relevant flora and fauna, specific management measures intended to protect them, and responsibilities for reporting sightings and incidents involving threated fauna.

- A database of conservation significant fauna species sightings will be maintained.

- All native fauna injuries or mortalities will be recorded and reported internally, and to appropriate regulatory agencies where required.

- Implementation of the Talison feral animal control program on an annual and ad hoc basis as required. The program involves annual baiting for foxes and rabbits and feral cat trapping.

- Putrescible waste will be stored within lidded bins which prevent fauna entry to prevent attracting feral animals.

- Implementation of traffic management rules to minimise the likelihood of fauna injury or mortality due to interaction with vehicles. Rules include prohibition of off-road driving unless authorised for a specific purpose (i.e. exploration) and reduced speed limits on internal roads.

- Clearing will be timed outside the Black Cockatoo breeding season wherever possible.

- Prior to clearing, a suitably qualified environmental professional (fauna spotter) will identify and check known hollows for the presence of native fauna (Black Cockatoos or Western Ring Tail Possum). Where nesting animals are identified the tree will be marked and excluded from clearing until the resident animals have moved from the hollow.

- In addition to checking of hollows, prior to the commencement of clearing, ground searches of clearing areas will be undertaken, and any native fauna found will be relocated, or encouraged to move to neighbouring vegetation.

- A suitably qualified environmental professional (fauna spotter) will be present during all land clearing. The person will hold a permit to handle and move significant fauna under Regulation 15 of the WC Act, and have access to a care facility that can be used to rehabilitate injured fauna.

- Wherever practical land clearing will be undertaken on one front only in a direction which provides an opportunity for fauna to escape the clearing area to surrounding vegetation.

- Where trenches are established (i.e for pipelines or services), which native fauna are unable to escape from, they will be inspected by a “fauna spotter” on a regular basis (i.e. dawn, midday and prior to sunset). Any entrapped fauna will be removed and relocated to surrounding vegetation. If trenches are left open overnight, ramps will be established to permit native fauna to escape.

- Signage will be installed along roads passing through areas identified as key fauna habitat for MNES highlighting their potential presence.

- All ponds will have appropriate fauna egress to prevent native fauna becoming trapped.

- Implementation of the Talison Greenbushes Operations Dust Management Plan to minimise dust emissions from the operation.

- Implementation of the Talison Greenbushes Operations Surface Water Management Plan intended to prevent potential impact to surface waters.

- Drainage design and design of landforms will be implemented to contain any potentially sediment laden flows within the Mine Development Envelope.

- Implementation of the site Talison Greenbushes Operations Hot Work Permit System, and Emergency Management Procedures, to minimise the risk of bushfires.

- Clearing activities will not be undertaken when the Fire Danger Rating is severe or higher.

In addition to the measures described above, some of the tenement conditions which apply to the Project tenure are intended to prevent dieback impacts occurring as a result of the mining operation, and place onus on the Talison to rehabilitate any impact which does occur. The tenement conditions are included below:

- The Lessee at his own expense shall carry out all necessary measures to prevent the spread of jarrah dieback disease on the areas of the lease and shall liaise with the District Manager before commencing exploratory work outside areas being mined.

- The Lessee at its own expense shall rehabilitate all areas affected by mining or operations associated with mining including the rehabilitation enrichment of dieback or other forest disease affected areas resulting from the Lessee's mining or operations associated with mining to the reasonable requirements of the State Mining Engineer and the Executive Director.

The measures described are predominantly already implemented within Talison’s existing activities and management. Existing management plans and procedures will be updated prior to commencing the Project to address changes associated with the expansion activities, and updated knowledge of MNES present. As an additional measure intended to minimise and prevent impacts to MNES, Talison will also develop a Conservation Significant Species Management Plan for the Greenbushes Lithium Mine which will document all management measures and monitoring targeted to threatened and other specially protected flora and fauna species known to occur within, or in close proximity to, the Mine Development Envelope.

Rehabilitation

In addition to minimising impacts to MNES through operational controls, Talison will undertake rehabilitation of disturbed areas (excluding the open pit) in order to return habitat which has been removed over time. Rehabilitation will be undertaken in accordance with the approved Mine Closure plan for the Project. The current Mine Closure Plan was approved by (now) DMIRS in 2017. The Mine Closure Plan is currently being revised and updated for the expanded mining operation and will be submitted to DMIRS for assessment and approval with the Mining Proposal which is also being developed for submission. The Mine Closure plan is currently revised on a three yearly basis in accordance with the requirements of tenement conditions.

The objective of rehabilitation is to establish a self?sustaining heath community with selected attributes compatible with surrounding Jarrah/Marri forest, and landforms that blend with the mine's undulating scarp location. Prior to rehabilitating landforms, they are shaped to an appropriate final landform (typically no greater that 20° slopes), and any drainage features are established. Growth medium is applied which can comprise topsoil (if available), or weathered regolith material that has proven suitable for rehabilitation of current mining landforms.

Rehabilitation areas are planted with seedlings, including Corymbia calophylla (Marri), Eucalyptus marginata (Jarrah), Eucalyptus patens (Blackbutt) and Eucalyptus rudis (Flooded Gum). The rehabilitation areas are direct sown with provenance seed by hand which is typically sourced from within 50 km of Greenbushes. In some years scarcity of key components in the seed mix may require seed to be collected from beyond this boundary. Where practical, seed is collected from mine areas which have been rehabilitated. Seed mixes are reviewed and modified dependant on the type of landform being rehabilitated, recommendations of annual rehabilitation monitoring, and availability of seed.

Weed control is an important component of rehabilitation due to weeds readily colonising disturbed areas. Targeted weed control is typically undertaken during the first three growing seasons of areas of rehabilitation to minimise weeds, and promote native vegetation growth. In addition, the seed mix used in site rehabilitation includes an Acacia species component which provides a fast growing cover able to compete with weed species, but which senesces within five years and is readily replaced by longer living but slower establishing understory species including, Hakea, Casuarina, Bossiaea and Hypocalymma.

Rehabilitation works also include incorporation of fauna habitat structures (logs, wood debris and rocky outcrops) to encourage the early return of native fauna such as reptiles and small mammals.

4.2 For matters protected by the EPBC Act that may be affected by the proposed action, describe the proposed environmental outcomes to be achieved.

The Project has the potential to impact on MNES, specifically threatened fauna species including the Carnaby's Cockatoo, Forest Red-tailed Black Cockatoo and Baudin's Cockatoo, Western Ringtail Possum, Chuditch, Quokka and Pink Spider Orchid. Up to 385 ha of native vegetation habitat suitable for these species will be removed as a result of the mine expansion activities. Native vegetation clearing will be staged with clearing undertaken for development of infrastructure and landforms as required.

The proposed environmental outcomes for the threatened fauna species listed are:

-No mortality of threatened fauna species as a result of clearing activities associated with the Project. Known species which have been recorded within the Mine Development Envelope during fauna surveys include Carnaby's Cockatoo, Forest Red-tailed Black Cockatoo and Baudin's Cockatoo, and Chuditch. Other threatened fauna species which have been identified as potentially occurring within the Mine Development Envelope include the Numbat, Western Ringtail Possum, and Quokka.

· No detrimental impact on habitat of threatened fauna species outside the Mine

Development Envelope as a result of weed or disease spread to adjacent areas, sedimentation from runoff, reduced availability of surface or groundwater, or accidental clearing beyond the Mine Development Envelope which is associated with the implementation of the Project.

· No detrimental impact on habitat of the Pink Spider Orchid outside the Mine Development Envelope as a result of weed or disease spread to adjacent areas, sedimentation from runoff, reduced availability of surface or groundwater, or accidental clearing beyond the Mine Development Envelope which is associated with the implementation of the Project.

-Counterbalance the loss of up to 385 ha of fauna habitat suitable for MNES, inclusive of up to 50 trees with potential black cockatoo breeding hollows, through provision of offsets.

The Project will have a potentially significant residual impact due to the removal of up to 385 ha of fauna habitat suitable for threatened fauna species listed under the EPBC Act. The fauna habitats which will be removed include Jarrah/Marri Forest and Jarrah/Marri Forest over Banksia dominated mid-storey.

To offset the residual impacts of the proposed clearing of up to 385 ha of threatened fauna habitat, Talison proposes to develop and implement an offset strategy. The strategy will be based primarily on acquisition and protection of land (direct offsets) which may also be supported by research and management funding if sufficient offset area is unable to be identified. The offset strategy will document how Talison will identify suitably sized area/s, with appropriate fauna habitat values, which will be purchased and vested to the DBCA for inclusion in the conservation estate. Talison has been in consultation with DBCA in regards to the proposal to vest land to the conservation estate and they have indicated their support to this proposed approach.

An initial estimate of the total quantum of residual impact of the clearing of up to 385 ha of fauna habitat has been undertaken based on the habitat quality assessment of the Mine Development Envelope (Ennovate 2018) and using the DoEE Offset Assessment Guide. Based on this calculation the total quantum of residual impact is estimated to be 231 ha. The size of the final offset area will be dependent on the quality of the habitat identified and fauna habitat values present.

Section 5 – Conclusion on the likelihood of significant impacts

A checkbox tick identifies each of the matters of National Environmental Significance you identified in section 2 of this application as likely to be a significant impact.

Review the matters you have identified below. If a matter ticked below has been incorrectly identified you will need to return to Section 2 to edit.

5.1.1 World Heritage Properties

No

5.1.2 National Heritage Places

No

5.1.3 Wetlands of International Importance (declared Ramsar Wetlands)

No

5.1.4 Listed threatened species or any threatened ecological community

Listed threatened species and communities - Yes

5.1.5 Listed migratory species

No

5.1.6 Commonwealth marine environment

No

5.1.7 Protection of the environment from actions involving Commonwealth land

No

5.1.8 Great Barrier Reef Marine Park

No

5.1.9 A water resource, in relation to coal/gas/mining

No

5.1.10 Protection of the environment from nuclear actions

No

5.1.11 Protection of the environment from Commonwealth actions

No

5.1.12 Commonwealth Heritage places overseas

No

5.2 If no significant matters are identified, provide the key reasons why you think the proposed action is not likely to have a significant impact on a matter protected under the EPBC Act and therefore not a controlled action.

N/A

Section 6 – Environmental record of the person proposing to take the action

Provide details of any proceedings under Commonwealth, State or Territory law against the person proposing to take the action that pertain to the protection of the environment or the conservation and sustainable use of natural resources.

6.1 Does the person taking the action have a satisfactory record of responsible environmental management? Please explain in further detail.

Yes

The Talison Greenbushes Lithium Mine has an excellent history of environmental performance. The site operates in accordance with the conditions and requirements of the previously described permits and approvals (Section 1.12) and maintains positive relationships with regulatory and community stakeholders. The Mine has been operating since 1983 with no significant impacts to the environment having occurred as a result of activities at the mine during this time. Talison has also improved the surrounding environment throughout the history of the operation of the Greenbushes Lithium Mine through an ongoing program of rehabilitation of historic mining areas such as shafts and dredging operations which remained from late 19th and early 20th century mining activity. The progressive rehabilitation program undertaken by Talison has reduced the area of disturbance associated within the mining operation over time from its original extent.

Talison strives to attain a high level of environmental performance through the implementation and maintenance of an integrated management system which is certified to International Standards ISO 9001:2015 Quality Management System requirements by BVQI. Part of the integrated management system is the site environmental management system (EMS) which is also certified, to ISO 14001:2015 Environmental Management System requirements. Talison undertakes regular review of the EMS and implements any improvements identified to reduce the impact of the mining operation within the defined Mine Development Envelope, and on the surrounding environment and neighbouring communities.

6.2 Provide details of any past or present proceedings under a Commonwealth, State or Territory law for the protection of the environment or the conservation and sustainable use of natural resources against either (a) the person proposing to take the action or, (b) if a permit has been applied for in relation to the action – the person making the application.

N/A

6.3 If it is a corporation undertaking the action will the action be taken in accordance with the corporation's environmental policy and framework?

Yes

6.3.1 If the person taking the action is a corporation, please provide details of the corporation's environmental policy and planning framework.

Talison Lithium Australia Pty Ltd is committed to sustainable development and regards environmental management and rehabilitation of mining operations as among its highestpriorities.Talison operate in accordance with an Environmental Policy Statement which reflects Talison’s commitment to protecting the environment and continual improvement of environmental performance through undertaking the following:? Integrating environmental, social and economic considerations into project planning, exploration, operations, rehabilitation and decommissioning? Implementing environmental controls and strategies to identify, minimise and, wherever possible, avoid environmental harm arising from operations? Monitoring relevant environmental parameters? Auditing and reporting environmental performance? Preventing pollution by minimising emissions and the generation of waste and disposing of wastes in an environmentally responsible manner? Communicating openly with stakeholders and particularly the community about environmental management? Provision of sufficient training and resources for effective environmental management? Provision of a framework for setting and reviewing environmental objectives and targetsAs described in Section 6.1 Talison operates in accordance with Environment and Quality Management Systems which are certified to International Standards ISO 9001:2015 and ISO 14001:2015. Planning and review of environmental performance is captured within thenagement system requirements.

6.4 Has the person taking the action previously referred an action under the EPBC Act, or been responsible for undertaking an action referred under the EPBC Act?

Yes

6.4.1 EPBC Act No and/or Name of Proposal.

Talison Lithium Greenbushes Operations – Clearing for Waste Rock Dump Expansion (EPBC 2013/6904).

Section 7 – Information sources

You are required to provide the references used in preparing the referral including the reliability of the source.

7.1 List references used in preparing the referral (please provide the reference source reliability and any uncertainties of source).

Reference Source	Reliability	Uncertainties
Bain, K. T. (2015). The ecology of the Quokka (Setonix brachyurus) in the Southern Forests of Western Australia. University of Western Australia.	Reliable. Peer reviewed report.	None
Biologic (2011). Greenbushes Level 1 Fauna Survey. Unpublished report prepared for Talison Lithium Australia Pty Ltd.	Reliable. Peer reviewed report.	None
Biologic (2018a). Greenbushes Vertebrate, SRE and Subterranean Fauna Desktop Assessment V1. Unpublished report prepared for Talison Lithium Australia Pty Ltd.	Reliable. Peer reviewed report.	None
Biologic (2018b). Greenbushes Targeted Vertebrate and SRE Invertebrate Fauna Survey V1. Unpublished report prepared for Talison Lithium Australia Pty Ltd.	Reliable. Peer reviewed report.	None
Brad Goode & Associates (2016). Report of An Aboriginal Heritage Survey of Areas within Talison Lithium Greenbushes Operations at Greenbushes, Western Australia. Unpublished report prepared for Talison Lithium Australia Pty Ltd.	Reliable. Peer reviewed report.	None
Brown, A., Dixon, K., French, C. and Brockman, G. (2013) Field Guide To The Orchids of Western Australia. Simon Nevill Publications. Perth, Western Australia.	Reliable. Published Guidance	None
Bureau of Meteorology (BoM)	Reliable, Government database	None

Reference Source	Reliability	Uncertainties
(2017). Groundwater Dependent Ecosystems Atlas. Australian Government. Available from: http://www.bom.gov.au/water/groundwater/gde/		
Campbell, G. (2000). Greenbushes Operations Multi-Element Composition of Waste Rock and Soil Samples (Static-Testwork Programme: Phase II), Implications for Waste-Rock Management. Unpublished report prepared for Sons of Gwalia Ltd.	Reliable. Peer reviewed report.	None
Campbell, G. (2014). Greenbushes Mine: Appraisal of Drainage-Water Quality from Floyd's Dump and Implications for Future Mine Waste Management. Unpublished report prepared for Talison Lithium Australia Pty Ltd.	Reliable. Peer reviewed report.	None
Christensen, P. (2016). Greenbushes Wetland Bird Survey. Unpublished report prepared for Blackwood Basin Group.	Reliable. Peer reviewed report.	None
Croeser, L., Paap, T., Culver, M & E., Andrew, M., Hardy, G. & Burgess, T. (2018). Field survey, isolation, identification and pathogenicity of Phytophthora species associated with a Mediterranean-type tree species. Forest Pathology. e12424. 10.1111/efp.12424.	Moderate Reliability. Current research. Published paper.	None
Department of Agriculture and Food, Western Australia (DAFWA) (2007). Soil-landscape mapping in South-western Australia. Perth, Department of Agriculture and Food.	Reliable, Government publication.	None
Department of Biodiversity, Conservation and Attractions (DBCA) (2018). Threatened and Priority Fauna Database	Reliable, Government publication.	None

Reference Source	Reliability	Uncertainties
(custom search). Retrieved 2018 (in Biologic, 2018b)		
Department of Environment and Conservation (2012). Chuditch (Dasyurus geoffroii) Recovery Plan. Wildlife Management Program No. 54. Department of Environment and Conservation, Perth, Western Australia.	Reliable, Government publication.	None
Department of Environment and Conservation (2013). Quokka Setonix brachyurus Recovery Plan. Wildlife Management Program No. 56. Department of Environment and Conservation, Perth, WA.	Reliable, Government publication.	None
Department of Environment and Conservation (2008) Forest Black Cockatoo (Baudin's Cockatoo Calyptorhynchus baudinii and Forest Redtailed Black Cockatoo Calyptorhynchus banksii naso) Recovery Plan. Wildlife Management Program No. 42. Department of Environment and Conservation, Perth, WA.	Reliable, Government publication.	None
Department of Parks and Wildlife (2013) Carnaby's cockatoo (Calyptorhynchus latirostris) Recovery Plan. Wildlife Management Program No. 52. Department of Parks and Wildlife, Perth, WA	Reliable, Government publication.	None
Department of Parks and Wildlife (2017). Western Ringtail Possum (Pseudocheirus occidentalis) Recovery Plan. Wildlife Management Program No. 58. Department of Parks and Wildlife, Perth, WA	Reliable, Government publication.	None
Management Program No. 58. Department of Parks and Wildlife, Perth, WA	N/a	N/a
Department of the Environment (DotE) (2013) Significant Impact Guidelines 1.1. DotE.	Reliable, Government publication.	None

Reference Source	Reliability	Uncertainties
Canberra, Australia.		
Department of the Environment and Energy (DoEE) (2018). Setonix brachyurus in Species Profile and Threats (SPRAT) database. Canberra: DoEE. Available from: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=229	Reliable, Government database	None
Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) (2012) Referral guidelines for three species of Western Australian black cockatoos. DSEWPaC. Canberra, Australia	Reliable, Government publication.	None
Ennovate (2018) Black Cockatoo Habitat Quality Assessment - 2018 Expanded Mine Development Area. Memo to Talison Lithium Australia.	Reliable. Peer reviewed report.	None
GHD, 2016. Talison Lithium Mine - Characterisation of Acid Metalliferous Drainage Potential from Tailings Storage Facility 2. Unpublished report prepared for Talison Lithium Australia Pty Ltd.	Reliable. Peer reviewed report.	None
Government of Western Australia (2018a). 2017 Statewide Vegetation Statistics incorporating the CAR Reserve Analysis (Full Report). Current as of October 2017. WA Department of Biodiversity, Conservation and Attractions, Perth, Western Australia.	Reliable. Government database	None
Government of Western Australia (2018b). 2017 Southwest Vegetation Statistics incorporating the CAR Reserve Analysis (Full Report). Current as of October 2017. WA Department of Biodiversity, Conservation and Attractions, Perth, Western Australia.	Reliable. Government database	None
Hayward, M. W., de Tores, P.	Reliable. Published paper.	None

Reference Source	Reliability	Uncertainties
J., Dillon, M. J., and Banks, P. B. (2007). Predicting the occurrence of the quokka, Setonix brachyurus (Macropodidae: Marsupialia), in Western Australia's northern jarrah forest. Wildlife Research 34, 194-199.		
Hearn, R., Williams, K., Comer, S., and Beecham, B. (2002). A Biodiversity Audit of Western Australia's 53 Biogeographical Subregions in 2002 - Jarrah Forest 2 (JF2 – Southern Jarrah Forest subregion). Department of Conservation and Land Management. Perth, Western Australia.	Reliable, Government publication.	None
Hearn, R.W., Meissner, R., Brown, A. P., Macfarlane, T.D. and Annels, T.R. (2006) Declared Rare and Poorly Known Flora in the Warren Region. Department of Conservation and Land Management. Perth, Western Australia.	Reliable, Government publication.	None
Kirkby, T. (2013). Black Cockatoo Survey, Floyd's Extension, Talison Mining, Greenbushes. Unpublished report to Talison Lithium Australia.	Reliable. Peer reviewed report.	None
Kirkby, T. (2018) Black Cockatoo Survey, Talison Mining, Greenbushes. Unpublished report to Talison Lithium Australia.	Reliable. Peer reviewed report.	None
Mattiske, EM & Havel JJ. 1998. Vegetation Mapping in the South West of WA & Region Forest Agreement vegetation complexes. Map sheets for Pemberton, Collie, Pinjarra, Busselton-Margaret River, Mt Barker, & Perth, Western Australia. Scale 1:250,000. CALM, Perth, WA	Reliable, Government publication.	None

Reference Source	Reliability	Uncertainties
Onshore Environmental (2012) Flora & Vegetation Survey: Greenbushes Mining Leases. Unpublished report prepared for Talison Minerals Pty Ltd.	Reliable. Peer reviewed report.	None
Onshore Environmental (2018). Greenbushes Mining Operations Detailed Flora and Vegetation Survey. Unpublished report prepared for Talison Lithium Australia Pty Ltd.	Reliable. Peer reviewed report.	None
Talison Lithium Australia (Talison) (2015). Greenbushes Operations Surface Water Management Plan Version 5 – Site Management Plan ENV 1001. Unpublished report prepared for Talison Lithium Australia Pty Ltd	Reliable. Peer reviewed report.	None
Significant Environmental Services (SES), (2017). Greenbushes Mine – TSF and Process Dam Areas Water Monitoring Review 2016/17. Unpublished report prepared for Talison Lithium Australia Pty Ltd	Reliable. Peer reviewed report.	None
Water Corporation. (2004). Greenbushes Catchment Area Drinking Water Source Protection Assessment. Unpublished report prepared for the Department of Environment. Leederville, Western Australia	Reliable. Peer reviewed report.	None
Webb, A., Kinloch, J., Keighery, G. and Pitt, G. (2016). The Extension of Vegetation Complex Mapping to Landform boundaries within the Swan Coastal Plain Landform and Forested Region of South West, Western Australia. Department of Parks and Wildlife, Bunbury, Western Australia.	Reliable. Government publication.	None

Section 8 – Proposed alternatives

You are required to complete this section if you have any feasible alternatives to taking the proposed action (including not taking the action) that were considered but not proposed.

8.0 Provide a description of the feasible alternative?

There are no feasible alternatives to undertaking the action. Mineral resource developments arelimited in the extent they can be moved from the location where the resource has beenidentified. The only alternative to undertaking the Project is not to undertake development of theProject. There are currently two Lithium Hydroxide Production Plants under construction orplanned to commence construction in 2018 which will be supplied by the increased outputresulting from the mine expansion. Failure to undertake the expansion would result in theproposed Plants not being developed to their planned extent, or not developed at all, due to therestricted availability of lithium mineral concentrate from the existing operation.Alternative strategies for waste rock and tailings storage involving use of the existing pits havenot been considered for the Project. The reason these strategies have been excluded fromconsideration is that pit backfilling is currently not able to be considered for the Greenbushesmine as the lithium resource is open at depth. The ore body is known to extend to over 500 mand is still open at this depth. The expanded pit only extends to 450 m depth. Filling of the pit with tailings or waste rock would therefore effectively sterilise the remaining resource

8.1 Select the relevant alternatives related to your proposed action.

8.27 Do you have another alternative?

No

Section 9 – Contacts, signatures and declarations

Where applicable, you must provide the contact details of each of the following entities: Person Proposing the Action; Proposed Designated Proponent and; Person Preparing the Referral. You will also be required to provide signed declarations from each of the identified entities.

9.0 Is the person proposing to take the action an Organisation or an Individual?

Organisation

9.2 Organisation

9.2.1 Job Title

Manager WHS Training & ENV

9.2.2 First Name

Steve

9.2.3 Last Name

Green

9.2.4 E-mail

steve.green@talisonlithium.com

9.2.5 Postal Address

Maranup Ford Road
GREENBUSHES WA 6254
Australia

9.2.6 ABN/ACN

ACN

139401308 - Talison Lithium Australia Pty Ltd

9.2.7 Organisation Telephone

08 97825700

9.2.8 Organisation E-mail

environment@talisonlithium.com

9.2.9 I qualify for exemption from fees under section 520(4C)(e)(v) of the EPBC Act because I am:

Not applicable

Small Business Declaration

I have read the Department of the Environment and Energy's guidance in the online form concerning the definition of a small a business entity and confirm that I qualify for a small business exemption.

Signature:..... Date: .....

9.2.9.2 I would like to apply for a waiver of full or partial fees under Schedule 1, 5.21A of the EPBC Regulations

No

9.2.9.3 Under sub regulation 5.21A(5), you must include information about the applicant (if not you) the grounds on which the waiver is sought and the reasons why it should be made

Person proposing the action - Declaration

I, STEPHEN GREEN, declare that to the best of my knowledge the information I have given on, or attached to the EPBC Act Referral is complete, current and correct. I understand that giving false or misleading information is a serious offence. I declare that I am not taking the action on behalf of or for the benefit of any other person or entity.

Signature:..... Date: 10-5-18.....

I, _____, the person proposing the action, consent to the designation of _____ as the proponent of the purposes of the action describe in this EPBC Act Referral.

Signature:..... Date: .....

9.3 Is the Proposed Designated Proponent an Organisation or Individual?

Organisation

9.5 Organisation

9.5.1 Job Title

Manager WHS Training & ENV

9.5.2 First Name

Steve

9.5.3 Last Name

Green

9.5.4 E-mail

steve.green@talisonlithium.com

9.5.5 Postal Address

Maranup Ford Road
Greenbushes WA 6254
Australia

9.5.6 ABN/ACN

ACN

139401308 - Talison Lithium Australia Pty Ltd

9.5.7 Organisation Telephone

08 97825700

9.5.8 Organisation E-mail

environment@talisonlithium.com

Proposed designated proponent - Declaration

I, STEPHEN GREEN, the proposed designated proponent, consent to the designation of myself as the proponent for the purposes of the action described in this EPBC Act Referral.

Signature:..... Date: 10-5-18

9.6 Is the Referring Party an Organisation or Individual?

Organisation

9.8 Organisation

9.8.1 Job Title

Manager WHS Training & ENV

9.8.2 First Name

Steve

9.8.3 Last Name

Green

9.8.4 E-mail

environment@talisonlithium.com

9.8.5 Postal Address

Maranup Ford Road
Greenbushes WA 6254
Australia

9.8.6 ABN/ACN

ACN

139401308 - Talison Lithium Australia Pty Ltd

9.8.7 Organisation Telephone

08 97825700

9.8.8 Organisation E-mail

environment@talisonlithium.com

Referring Party - Declaration

I, STEPHEN GREEN, I declare that to the best of my knowledge the information I have given on, or attached to this EPBC Act Referral is complete, current and correct. I understand that giving false or misleading information is a serious offence.

Signature:..... Date: 10-5-18

Appendix A - Attachments

The following attachments have been supplied with this EPBC Act Referral:

6136579_rpt_greenbushes_expansion_epbc_referral.pdf
attachment_1_-_figures1-12.pdf
attachment_3_-_stakeholder_consultation_record.pdf
attachment_4_-_ep_act_part_v_licence_and_amendment_notices_combined.pdf
attachment_5_-_tenement_conditions.pdf
attachment_6_-_biologic_2011_greenbushes_talison_tenure_fauna_survey.pdf
attachment_7_-_biologic_2018a_greenbushes_fauna_desktop.pdf
attachment_8_-_biologic_2018b_greenbushes_targeted_fauna.pdf
attachment_9_-_ennovate_2018_-_black_cockatoo_habitat_assessment.pdf
attachment_10_-_kirkby_2018_black_cockatoo_survey_talison_mde.pdf
attachment_11_-_onshore_2012_flora_and_veg_survey.pdf
attachment_12_-_onshore_2018a_flora_and_veg_desktop_assessment.pdf
attachment_13_-_onshore_2018b_greenbushes_flora_and_veg_survey_mde.pdf
attachment_14_-_ses_annual_water_monitoring_review_2016-2017_part1.pdf
attachment_14_-_ses_annual_water_monitoring_review_2016-2017_part2.pdf
attachment_14_-_ses_annual_water_monitoring_review_2016-2017_part3.pdf
attachment_15_-_talison_environmental_policy_statement.pdf
attachment_16_-_qas3007_-_environmental_management.pdf
refer_to_documents_for_section_2.pdf